

CONSTRUCTION DETAILS

Part 2-Earthwork

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SECTION 201-CLEARING AND GRUBBING

201.01-Description. This work shall consist of clearing, grubbing, removal and disposal of all vegetation and debris within the limits of the rights-of-way and easement areas, except objects designated to remain, or are to be removed in accordance with other sections of these Specifications, as indicated otherwise on the Plans or as directed by the Engineer. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

EQUIPMENT

201.02-Equipment. All equipment necessary for the satisfactory performance of the work shall be on the project and approved before the work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

201.03-Clearing and Grubbing. The Engineer or Contractor when required will establish rights-of-way lines and construction lines, and the Engineer will designate all trees, shrubs, plants, and other objects to remain. The rights-of-way necessary for construction, as directed by the Engineer, shall be cleared of all dead trees, stumps, brush, projecting roots, hedge, weeds, pole stubs, logs, and other objectionable material. All trees, stumps, roots, pole stubs, brush, hedge, and other protruding obstructions within the area bounded by lines 5 ft. (1.5 m) outside the construction lines shall be completely grubbed except sound undisturbed stumps and roots which will be a minimum of 5 ft. (1.5 m) below subgrade or slope of embankment may be allowed to remain in place provided undercutting or other corrective measures, or topsoil stripping is not stipulated in the Plans or directed by the Engineer and providing stumps do not extend more than 6 in. (15 cm) above the ground surface. This work shall be done in advance of excavation and embankment operations.

When embankments are to be constructed in swampy areas, and undercutting or other corrective measures are not stipulated in the Plans or directed by the Engineer for these areas, undisturbed trees and stumps may be cut off at not more than 6 in. (15 cm) above the ground surface or low water level and the stump and root mass remain in place, if approved by the Engineer.

Unless marked for removal by the Engineer, living trees more than 5 ft. (1.5 m) outside the construction lines of the road are to be undisturbed, and are to be protected by the Contractor during construction of the project. Cut or scarred surfaces of trees or shrubs shall be treated with a paint prepared especially for tree surgery.

Clearing of hedge, weeds, pole stubs, logs, and other objectionable material inside the rights-of-way but outside the construction lines shall be completed to the ground surface.

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. Branches of

trees extending over the roadbed shall be trimmed to give a clear height of 20 ft. (6 m) above the roadbed surface. All trimming shall be done by skilled workmen and in accordance with good tree surgery practices.

Trees more than 5 ft. (1.5 m) outside the construction lines and marked for removal by the Engineer shall be cut off within 6 in. (15 cm) of the ground surface. All stumps more than 5 ft. (1.5 m) outside the construction lines shall be trimmed to within 6 in. (15 cm) of the ground surface.

Wood debris that is chipped on site shall be properly disposed of so that does not become part of embankment. Within the areas where embankments are to be constructed, all depressions resulting from grubbing operations shall be backfilled with suitable excavation material and compacted in accordance with the provisions of **Section 205** to natural ground elevation before embankment construction is started.

Depressions in excavation areas which are below finished subgrade elevation resulting from grubbing operations shall be backfilled with suitable material and compacted to finished subgrade in accordance with the provisions of **Section 205** during the excavation operations.

Backfilling shall be completed a satisfactory distance ahead of embankment construction operations.

All slopes of cuts, embankments, ditches, channels, waterways and all structures both old and new, shall be cleared of all brush, hedges, weeds, heavy vegetation, and other objectionable material; and shall be maintained in a neat and satisfactory condition until the project is accepted.

Areas approved as borrow pits by the Engineer shall be cleared and grubbed of all trees, stumps, brush and heavy vegetation. Areas designated for obtaining construction material other than borrow material shall be cleared and grubbed of trees, stumps, brush and vegetation, and in addition shall be stripped of overburden laying above the material to be obtained. This work shall be completed well in advance of the removal of borrow or construction materials.

Areas within the limits of all drainage structures shall be cleared of all objectionable material to within 3 in. (75 mm) of the ground surface. Such areas shall extend the full length of the structures, as measured along the center-line of the highway, and to the rights-of-way lines along lines parallel to the centerline of the inlet and outlet channel or drainage of the structure. These areas shall also include the entire area of all easements obtained for drainage purposes.

201.04-Disposal of Debris. If perishable material is burned, it shall be burned under the constant care of competent watchmen at such times and in such a manner that the surrounding vegetation, other adjacent property, or anything designated to remain on the rights-of-way will not be jeopardized. Burning shall be done in accordance with applicable laws and ordinances.

When permitted by the Engineer, perishable materials and debris may be removed from the rights-of-way and disposed of at locations off the project, outside the limits of view from the project during all seasons with the written permission of the property owner on whose property the materials and debris are to be placed. The Contractor shall make all necessary arrangements with property owners for obtaining suitable disposal locations and the cost involved shall be included in the unit price

bid for other items of construction. A copy of each agreement with property owners is to be furnished the Engineer. In addition the material shall be disposed of in accordance with all applicable laws and ordinances regarding solid wastes as per Tennessee Department of Environment and Conservation requirements.

If the construction is through land subject to scour, the Engineer may direct the Contractor to dispose of stumps, logs, brush, etc. in the scoured ditches within the limits of the rights-of-way and cover the material so deposited with suitable excavation or borrow material. If the Contractor secures permission to dispose of such material in scoured ditches on private property but within view of the roadway, he will be required to cover the material so deposited thoroughly with suitable material at his own expense.

All merchantable timber in the clearing area which has not been removed from the rights-of-way prior to the beginning of construction shall become the property of the Contractor unless otherwise provided.

COMPENSATION

201.05-Method of Measurement. When the bid schedule contains an item for Clearing and Grubbing on a lump sum basis, no measurement of area will be made. In cases where changes in the contract documents affect the rights-of-way area or when additional Clearing and Grubbing is required in conjunction with the item for, Road and Drainage Excavation (Additional Material), a proportionate adjustment for the increased or decreased area will be made except when the item for Adjusted Clearing and Grubbing is in the bid schedule and then these adjustments in area will be measured and paid for by the acre(hectare).

Unless otherwise indicted by the Plans, no separate measurement or payment will be made for the items of work defined under Clearing and Grubbing and such will be considered incidental to the work.

When borrow material is obtained from borrow pits furnished by the Contractor, the clearing and grubbing cost shall be included in the unit price bid for Borrow Excavation. On areas obtained by the Department and designated as borrow pits, the cost of clearing and grubbing will be measured and paid for by the acre(hectare), provided the item for Clearing and Grubbing (Borrow Pits) is in the contract. When the item for Clearing and Grubbing (Borrow Pits) is not in the contract, the costs of clearing and grubbing areas obtained by the Department and designated as borrow pits, shall be included in the unit price bid for Borrow Excavation.

When the contract does not contain an item for Clearing and Grubbing, Clearing and Grubbing will be required within the construction limits of work being performed and will not be paid for directly but will be considered as a subsidiary obligation of the Contractor under other contract items.

201.06-Basis of Payments. Payment for Clearing and Grubbing shall be made at the contract unit price per lump sum and payment for adjustments to Clearing and Grubbing under the item for Adjusted Clearing and Grubbing at the contract unit price per acre(hectare), shall be full

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compensation for completing the Clearing and Grubbing as outlined on the Plans and in these Specifications.

When proportionate payments are made, they will be based on a price per unit of area obtained from the total area of rights-of-way acquired within the limits of the project before any change and the lump sum amount bid for Clearing and Grubbing.

Payment for Clearing and Grubbing (Borrow Pits) at the contract unit price per acre (hectare) shall be full compensation for completing the Clearing and Grubbing of Department furnished borrow pits as outlined in the Plans and in these Specifications.

**SECTION 202-REMOVAL OF STRUCTURES AND
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SECTION 202-REMOVAL OF STRUCTURES AND OBSTRUCTIONS

202.01-Description. This work shall consist of the removal, wholly or in part, and satisfactory disposal of all buildings, fences, structures, old pavements, abandoned pipe lines, and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the Contract. It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes, and pits. When the Proposal does not include pay items for Removal of Structures and Obstructions as set out in this Section, such work shall be performed and the costs thereof shall be included in the prices bid for other items of construction.

EQUIPMENT

202.02-Equipment. All equipment necessary for the satisfactory performance of this work shall be on the project and approved before the work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

202.03-General. The Contractor shall raze, remove and dispose of all buildings and foundations, structures, fences and other obstructions, any portions of which are on and off the rights-of-way as indicated on the plans, except utilities and those for which other provisions have been made for removal. All material from such work designated to become the property of the Department shall be removed without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored and protected by the Contractor at specified places within the project limits or indicated by the plans, and all material not so designated will become the property of the Contractor and shall be disposed of outside the limits of view from the project. If the material is disposed of on private property, the Contractor shall secure written permission from the property owner. A copy of each agreement with property owners is to be furnished the Engineer.

The Department reserves the right to dispose of buildings on any tract prior to their being torn down or removed by the Contractor. Structures containing friable asbestos and specified to be removed by the Contractor shall be demolished by the Contractor in accordance with the policy and regulations of the Tennessee Department of Environment and Conservation (TDEC), including prior notification to TDEC of all pending demolitions. The Department will remove any friable asbestos from the other structures to be demolished either prior to, or concurrently with, the Work. Such removal of friable asbestos by the Department may, or may not, include complete demolition of the structure. Any structure, or portion of a structure, remaining after removal of the asbestos by the Department shall be removed by the Contractor under the appropriate bid item or under the provisions of **Subsection 202.01**, as applicable.

Buildings and other structures, which are indicated on the Plans to be removed or disposed of by other agencies, will not be held as a charge or responsibility of the Contractor except that the Contractor waives any and all claims for interference, delay or damage due to their removal or nonremoval.

Foundations of buildings and other structures shall be removed to a depth of not less than 1 ft.(30 cm) below natural ground, except that within construction limits removal shall be to a depth of not less than 2 ft.(60 cm) below subgrade elevation. Basement floors shall be broken up to prevent holding of water. Basements or cavities left by structure removal shall be filled to the level of the surrounding ground or to Subgrade elevation within the prism of construction. The material placed in these cavities shall be compacted in accordance with the provisions of **Section 205, Embankments.**

202.04-Removal of Bridges, Culverts, and Other Drainage Structures.

Bridges, culverts and other drainage structures in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic.

Unless otherwise specified or directed, such portions of the substructures of bridges located in a stream shall be removed to 1 ft. (30 cm) below the adjacent ground level or natural stream bottom or the lowest scour elevation shown on the contract plans if shown to uncover the existing portion of the substructure. An exception to the above rule may occur if such portions of the substructure of a bridge is located in a navigable stream, and then it shall be subject to the requirements set out in the permit form of the applicable Federal agency approving the location and plans and authorizing the construction of the bridge. Where such portions of existing structures lie wholly or in part within the limits for a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

Steel bridges, precast or precast prestressed bridges and wood bridges designated to become the property of the Department shall be carefully dismantled without unnecessary damage. All such material shall be stored as specified in **Subsection 202.03.**

The removal of bridge decks shall be governed by the following:

1. Where bridge decks are to be wholly removed, but the girders are to remain in service;
 - A. If the contractor elects to employ concrete saws to aid in the removal of the concrete deck, sawing transverse, the depth of the cut may not exceed the following :
 - o Decks supported by steel beams or girders, 3-in. (75mm.)
 - o Decks supported by prestressed concrete beams, 3-in. (75mm.)
 - o Decks of cast-in-place hollow box or t-beam bridges, 1-in. (25mm.)

- B. The remainder of the slab depth under the cuts must be completed using pneumatically or electrically operated chipping hammers, not exceeding 60 lbs. (27.2 kgs.) in weight.
 - C. Longitudinal saw cuts may be full depth, but no closer than –
 - o Decks supported by steel beams or girders, within 1-in. (25 mm) of the widest top flanges.
 - o Decks supported by prestressed beams, within 1 in. (25 mm) of the top flange.
 - o Decks of hollow boxes or t-beam bridges, within 1-in. (25 mm) of the web, unless otherwise noted on the contract plans.
2. Where only the slab overhangs are to be removed, and if the contractor elects to employ concrete saws to aid in the removal of overhangs, only the top 1-in. (25 mm) of the slab may be saw cut. Pneumatically or electrically operated chipping hammers, not exceeding 60 lbs. (27.2 kgs.) in weight may be used to remove the remainder of the concrete. Care shall be taken not to damage transverse slab reinforcing bars.
 3. Where bridge decks are to be removed as part of complete bridge demolition and the contractor elects to employ concrete saws in the removal of the deck, the depth of the cuts may not exceed the following:
 - A. Decks supported by steel beams or girders, the plans depth of slab minus 1-in. (25 mm).
 - B. Decks of hollow box or t-beam bridges; if not otherwise shown on the contract plans, the contractor shall submit a plan to the engineer for approval.

The use of hoe rams, pneumatic shears, pavement breakers, or other heavy equipment to remove slabs, where girders or adjacent slab portions are to remain, is strictly prohibited.

Blasting or other operations necessary for the removal of an existing structure or obstruction, which may damage new construction, shall be completed prior to placing the new work, or adequate precautions shall be taken to prevent such damage.

202.05-Removal of Pipe. Pipe designated to become the property of the Department shall be carefully removed and every precaution taken to avoid breaking or damaging the pipe. Pipes shall be removed, and stored when necessary, so that there will be no loss or damage. The Contractor will be required to replace sections damaged by negligence or by use of improper methods.

202.06-Removal of Pavement, Sidewalks, Curbs, Etc. Constructed of Portland Cement Concrete. All pavement, base course, sidewalks, curbs, and gutters, etc. constructed of portland cement concrete designated for removal shall be disposed of as directed. Failure of the Plans to identify the existence of concrete pavement under asphaltic pavement shall not be construed to imply that concrete is not present. It shall be the Contractor's responsibility to determine the presence of concrete pavement when not identified by the Plans.

Concrete pavement, parking strip, and base, all with or without bituminous overlay, concrete curb and gutter, sidewalk, driveways, etc. shall be removed and disposed of as follows:

- If the items are below subgrade elevation, but by not more than 2 ft.(60 cm), they shall be removed, disposed of, and the work paid for in accordance with this **Section 202**.
- If the items are more than 2 ft.(60 cm) below subgrade elevation, they shall be broken into sizes not to exceed 2 ft.(60 cm) in maximum dimension and remain in place, unless it interferes with succeeding items of construction. The cost of this work shall be included in the unit price bid for other items of construction and shall not be paid for directly.
- If the items are above subgrade elevation, the removal and disposal of same shall be paid for as provided in **Section 203**.
- When specified, ballast, gravel, bituminous pavement or other pavement materials shall be removed and stockpiled as required in **Subsection 202.03**; otherwise, such materials shall be disposed of as directed.

202.07-Removal of Underground Storage Tanks The Department will remove and dispose of all Petroleum Underground Storage Tanks or Tank Systems through its Environmental Consultant. This work shall include removal and disposal of piping, pumps, and other tank fixtures, the investigation and testing of the tank(s) for leakage, and backfilling the resulting holes or trenches as specified on the plans or as approved by the Engineer. This work shall be done in accordance with the "Tennessee Petroleum Underground Storage Tank Act", the policies and regulations of the Tennessee Department of Environment and Conservation, the United States Environmental Protection Agency, and local ordinances or statutes governing removal of Underground Storage Tanks.

A Petroleum Underground Storage Tank shall be defined as any one or combination of tanks including underground piping which are used or have been used to contain an accumulation of petroleum substances, and the volume of which is 10% or more beneath the surface of the ground.

In the event the Department includes the pay item for this Removal and Disposal in the contract then before work begins, the Contractor shall submit an application for closure of each Petroleum Underground Storage Tank or Tank System to the Tennessee Department of Environment and Conservation, Division of Underground Storage Tanks.

The Contractor shall furnish the Engineer copies of his application for closure, the approval of that application from the Tennessee Department of

Environment and Conservation, laboratory test reports, closure notification form and all pertinent correspondence.

The Contractor shall engage a laboratory approved by the Tennessee Department of Environment and Conservation, to perform all required sampling and testing for leakage and/or contamination before and after removal of the tank(s). Upon receipt of written approval from the Tennessee Department of Environment and Conservation, the Contractor may proceed with removal of the tank(s) in strict adherence to the regulations of that Department. If soil testing either before or after tank removal reveals contamination of the soil, the Contractor shall remove and dispose of the contaminated soil in accordance with Tennessee Department of Environment and Conservation regulations.

If the volume of contaminated soil to be removed is 500 C.Y. (m^3) or less, removal and disposal of the contaminated soil will be paid for under the item for Road and Drainage Excavation (Unclassified). However, the removal, disposal and replacement of contaminated soil in excess of 500 C.Y. (m^3) may be considered Extra Work as set forth in **Subsection 104.03** of the **Standard Specifications** and paid for as such in accordance with **Subsection 109.04**, Methods of Payment for Extra Work.

After removal, the tank(s) and tank fixtures shall become the property of the Contractor unless otherwise stipulated in the plans. Ownership of the tank(s), however, shall not relieve the Contractor of the responsibility of labeling, transporting, and disposing of the tank(s) according to regulations of the Tennessee Department of Environment and Conservation.

After removal of the tank(s) and contaminated soil, the hole or trench shall be backfilled if required with material specified on the plans or approved by the Engineer. Cost of backfill material including hauling, placement, and compaction shall be included in the lump sum price bid for Removal of Underground Tanks.

202.08-Water Well Abandonment. This work shall consist of locating and sealing abandoned water wells and shall include the removal and satisfactory disposal of pumps, pipe, and other related items not provided for elsewhere in the contract. This work shall be performed in accordance with all applicable regulations of the Tennessee Department of Environment and Conservation.

Flowable fill used for sealing wells shall be as specified herein.

All abandoned wells shall be sealed by one of the following methods:

1. Wells with a diameter of 1 ft.(30 cm) or less.

All pumps and related plumbing shall be removed by a licensed driller or pump installer. Then the bore hole shall be cleared of all other obstructions and cleaned by a licensed well driller by drilling, blowing or bailing as applicable. Laundry bleach shall be added to the water in the well to equal 1 qt. (2.5 liters) of bleach for each 100 gal. (m^3) of water to disinfect the well. The number of gallons of water in the well can be obtained by subtracting the depth (in feet) to static water level from the total

depth of the well and then multiplying the result by the factor $0.0408D^2$ where D is the diameter of the well in in.. The number of cubic meters of water in the well can be obtained by subtracting the depth (in meters) to static water level from the total depth of the well and then multiplying the result by the factor $0.7854D^2$ where D is the diameter of the well in meters)

After disinfecting the well, the licensed well driller shall fill the well using flowable fill. Bentonite or other approved colloidal reagent in an amount equal to 1 1/2% by volume of the cement shall be used as an additive.

The flowable fill material shall extend from the bottom of the well to within 5 ft. (1.5 m) of the final surface where the well is in a roadway cut or to within 5 ft. (1.5 m) of the existing ground surface where the well is located under roadway embankment or where the well is outside of the construction limits. The flowable fill shall be piped directly to the point of application by a tremie or dump bailer to avoid segregation or dilution. The well casing shall be cut off flush with the top of the flowable fill material.

2. Wells with diameter greater than 1 ft. (30 cm).

All pumps and related plumbing shall be removed and the well cleared of all other obstructions as described in Item 1 above. The water in the well shall be disinfected by adding 1 qt. (2.5 liters) of bleach for each 100 gal. (m^3) of water. The amount of bleach to be used shall be computed as described in Item 1 above.

The bottom 5 ft. (1.5 m) of the well or a depth equal to the depth of the water, whichever is greater, shall be filled with flowable fill as specified in Item 1 above. The remainder of the well shall be filled with compacted soil. Any projecting well casing or wall shall be removed or cut off 5 ft. (1.5 m) below the existing or proposed ground surface, as applicable.

In the event that flowable fill loss is excessive due to crevices in the wall of the borehole, Mineral Aggregate, Type A Base, Grading "D" shall be used to seal the crevices. Once the crevices are sealed, filling with flowable fill shall be resumed.

Immediately after the wells have been sealed, an affidavit shall be sent to the Tennessee Water Supply Division stating the name of the licensed Contractor(s) who performed the cleaning and sealing of the wells, the project number, location of the wells, type and sequence of material used, volume of material used, and date completed.

COMPENSATION

202.09-Method of Measurement. When the Contract stipulates that payment will be made for removal of structures and obstructions on a lump sum basis, the pay item, Removal of Structures and Obstructions, will include all structures and obstructions encountered within the rights-of-way, except for any structures and obstructions specified for removal on a

unit basis with measurement and payment made by the unit stipulated in the Contract.

Removal of Rigid Pavements, Sidewalks, etc. to be paid for under **Section 202**, as provided for under **Subsection 202.06**, will be measured for payment by the square yard (square meter) in accordance with the provisions of **Section 109**, Measurement and Payment.

Where the removal of pipe is designated as a specific item, it will be measured in linear feet (meter).

When the contract stipulates that payment will be made for removal of Underground Storage Tanks on a lump sum basis, the pay item, Removal of Underground Tanks (Tract No. _____), will include all Underground Storage Tanks, piping, pumps, and other tank fixtures, any portion of which is on the designated tract.

The sealing of abandoned wells shall be measured per each, which includes the cost of the flowable fill.

The sealing of abandoned wells shall be measured per each except for the flowable fill for which measurement will be made by the cubic yard (cubic meter).

202.10-Basis of Payment. The accepted quantities of Removal of Structures and Obstructions will be paid for at the contract lump sum price bid, which price shall be full compensation for removing and disposing of the obstructions in accordance with the Contract.

The accepted quantities for Removal of Underground Tanks(Tract No. _____) will be paid for at the contract lump sum price bid, which price shall be full compensation for locating, drilling, testing, removing and disposing of the tank(s), and backfilling where required.

The lump sum payment for Water Well Abandonment shall be full compensation for all labor, equipment, materials, including flowable fill, and incidentals necessary to complete the work.

Specific obstruction items, including pipe removal, stipulated for removal and disposal under unit price pay items and Removal of Rigid Pavements, Sidewalks, etc. will be paid for at the contract unit price bid per unit specified in the proposal, which price shall be full compensation for removal and disposal of such items, excavation and subsequent backfill incidental to their removal. The price shall also include salvage of materials removed, their custody, preservation, storage on the rights-of-way, or disposal as provided herein.

Payment will be made only when payment for all or any part thereof is provided for in a "Pay Item."

**SECTION 203-EXCAVATION AND
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SECTION 203-EXCAVATION AND UNDERCUTTING

203.01-Description. This work shall consist of excavating and grading the roadway (including the removal of slides), borrow pits, waterways, ditches (including structure inlet and outlet ditches, channels, waterways, etc., even though they extend beyond the highway limits); intersections, approaches, benches under the side-hill embankments; excavating of unsuitable material from roadbed and beneath embankment areas; excavating selected material found in the roadway which is ordered for specific use in the construction; the construction and removal of detours authorized by the Engineer or otherwise detailed on Contract drawings; trimming and shaping of all slopes; and disposing of all excavated material all in accordance with these Specifications and in reasonably close conformity with the lines, grades and typical cross sections shown on the Plans or established by the Engineer. It shall include all embankment construction, **Section 205**, shoulder and ditch construction, **Section 208**, and in cases where construction of pavement or other surfacing is included in the Contract, Subgrade Construction and Preparation, **Section 207**.

203.02-Classification. The work will be classified and paid for as follows:

- (a) Road and Drainage Excavation (Unclassified).
All excavation performed under this Section, including portland cement concrete located above subgrade elevation, other than Borrow Excavation, Channel Excavation, and Undercutting, will be considered unclassified excavation regardless of the nature of the material excavated.
- (b) Borrow Excavation.
Borrow Excavation shall consist of material required for the construction of embankments or other portions of the work and shall be obtained from approved sources outside the right-of way limits, unless otherwise designated in the Plans. However, any material, other than Borrow Excavation (Unclassified), as may be found in the excavation that meets the specifications of the designated borrow material may be used in the project in accordance with the conditions prescribed in **Subsection 104.10**. However, if the flattening of certain cut slopes on projects graded under previous contracts is desirable and approved in writing by the Engineer, the Contractor will be permitted to use this material for borrow provided the material is satisfactory and in accordance with plans approved by the Engineer, and provided he complies with the requirements of **Subsection 203.04** regarding borrow areas. Borrow material shall not be obtained from wetland areas, unless otherwise noted on the Plans.

Borrow shall be classified as Borrow Excavation (Solid Rock), Borrow Excavation (Graded Solid Rock), Borrow Excavation (Unclassified), or Borrow Excavation (Select Material). Borrow Excavation (Solid Rock) shall consist of the removal and satisfactory placement of non-degradable rock which cannot be economically excavated by the proper use of a power shovel or without the use of explosives. Borrow Excavation (Unclassified) shall consist of the removal and satisfactory placement of all approved material encompassed under the classification of Borrow Excavation (Solid Rock) and all other approved material.

Borrow Excavation (Graded Solid Rock) shall consist of the removal and satisfactory placement of sound, non-degradable rock with a maximum size of 3 ft. (1 m). At least 50 percent of the rock shall be uniformly distributed between 1 ft. (30 cm) and 3 ft. (1 m) in diameter and no greater than 10 percent shall be less than 2 in. (50 mm) in diameter. The material shall be roughly equidimensional in shape. Thin, slabby material will not be accepted. The Contractor shall be required to process the material with an acceptable mechanical screening process that produces the required gradation. When the material is subjected to five alternations of the sodium sulfate soundness test (AASHTO T 104), the weighted percentage of loss shall be not more than 12. The material shall be approved by the Engineer before use.

Borrow Material other than solid rock shall be AASHTO M 145, classification A-6 or better if reasonably available. If classification A-6 is not reasonably available, the borrow shall be no worse than the predominant soil type in the roadway excavation based on AASHTO classification.

Borrow Excavation (Select Material) for special construction purposes shall meet the requirements set forth in the Contract.

Material obtained from an approved borrow source off the right-of-way as provided in this Subsection shall not be utilized to produce processed aggregate as described in Section 903. In no case shall material excavated from an off site borrow source be utilized in base or other paving courses above the elevation of the subgrade.

Unless otherwise designated in the Contract, the Contractor shall make his own arrangements for obtaining borrow material and shall pay all the costs involved including Archeological approval of source along with permits as required by the Tennessee Department of Environment and Conservation.

(c) Channel Excavation (Unclassified).

This item shall consist of the removal and satisfactory disposal of all material, regardless of its nature and the manner in which it may be removed, that is excavated for channel changes in widening, deepening, and straightening existing channels or constructing new ones, which have a width at the bottom of more than 14 ft. (4 m) as indicated on the Plans. All other similar

excavation with a bottom width 14 ft. (4 m) or less, as shown on the Plans, shall be paid for as Road and Drainage Excavation (Unclassified).

(d) Undercutting.

This item shall consist of removing and disposing of unsatisfactory materials below grade in cut sections, from areas upon which embankments are to be placed, and may also include material excavated below the Foundation elevation for pipe, box culverts and box bridges as described in **Subsection 204.12**. Undercutting does not include the stripping, stockpiling and placing of topsoil, described in **Subsection 203.06**, nor does it include step-benching in the preparation of embankment areas on hillsides.

EQUIPMENT

203.03-Equipment. All equipment necessary for the satisfactory performance of this work shall be on the project and approved before work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

203.04-General. Prior to beginning excavation, grading, and embankment operations in any area, all necessary Clearing and Grubbing, Removal of Structures and Obstructions and placement of Erosion Control Devices in that area shall have been performed in accordance with **Section 201**, **Section 202** and **Section 209**, respectively, of these Specifications.

Balance points, controlling the balancing of earthwork quantities as indicated on the Plans, are approximate only and it is the prerogative and obligation of the Engineer to make such changes in balance points as are necessary to aid further in balancing of earthwork quantities, or to dispose of surplus excavation.

Balance points, controlling the balancing of earthwork quantities as indicated on the Plans, are approximate only and it is the prerogative and obligation of the Engineer to make such changes in balance points as are necessary to aid further in balancing of earthwork quantities, or to dispose of surplus excavation, provided such changes do not move any balance point more than 2,000 ft. (600 m). The Contractor will not be allowed any additional compensation due to changing any or all of the balance points on the project no more than 2,000 ft. (600 m).

If the earthwork cannot be balanced without shifting the balance points more than 2,000 ft. (600 m), the Engineer may direct that excavation materials be hauled anywhere within the project limits. Overhaul of Road and Drainage Excavation (Unclassified) or Channel Excavation (Unclassified) from one balance to another balance after the balance points have been adjusted as provided above, shall be measured and paid for according to the provisions of **Subsection 203.09** and **Subsection 203.10**.

Excavation materials shall be removed in such a manner that the slopes may be neatly trimmed to the lines given. The Engineer may change the

slopes shown on the original cross sections, depress raised medians or islands, raise depressed medians or islands or daylight cuts to increase or decrease the quantity of Road and Drainage Excavation (Unclassified) provided the material can be excavated without blasting and these changes are set in the slope stakes prior to commencement of excavation of the affected slopes, medians or islands. Any additional material thus obtained shall be paid for at the contract unit price bid for Road and Drainage Excavation (Unclassified).

Excavation required to correct slides, regardless of its location relative to the theoretical slope line, or excavation required to prevent potential slides including blasting, and the dressing, reshaping or flattening of the affected slopes as directed by the Engineer, shall be paid for under the Item for Road and Drainage Excavation (Additional Material) in accordance with **Subsection 203.10**. If it becomes necessary to flatten a slope to correct a slide or prevent a potential slide after the cut has been started but not completed, payment under Road and Drainage Excavation (Additional Material) will be limited to material removed between the original staked slope line and the newly established slope line above the elevation to which the cut has been made. All other material will be paid for at the contract unit price of Road and Drainage Excavation (Unclassified). Seeding, sod and other incidental items required to repair the slide area will be paid for at the contract unit price bid for the respective items.

If more material is required to complete the embankments after all cuts have been brought to grade and all Road and Drainage Excavation (Unclassified) has been removed from within the balance, additional materials shall be obtained from within the rights-of-way by flattening, widening or daylighting cut slopes, and by depressing raised medians or islands at locations designated and as directed by the Engineer provided:

- (a) The cost of this material is more economical than borrow excavation.
- (b) The material is available within the adjusted balance where the shortage exists or the material may be hauled outside the limits of adjusted balance if the cost of the material is more economical than borrow when the additional cost of overhaul is considered.
- (c) The material can be excavated without blasting.
- (d) There is a minimum of 20 ft. (6 m) between the top of the existing slope and the top of the new slope and minimum of 5 ft. (1.5 m) between the top of the new slope and Rights-of-Way Line or Control Access fence. The 20 ft. (6 m) minimum will not apply when the existing slope is 4:1 or flatter or to overlapping or near overlapping slopes in medians or between parallel roads or ramps. The 20 ft. (6 m) minimum may be reduced at the written request of the Contractor.

This additional material is to be paid for under the item for Road and Drainage Excavation (Additional Material) in accordance with **Subsection 203.10**.

When additional material is paid for under the item for Road and Drainage Excavation (Additional Material) and additional clearing and grubbing is required, the additional clearing and grubbing will be measured and paid for by the acre (hectare), provided the item for Adjusted Clearing and Grubbing is in the Contract, otherwise a proportionate payment under the item for Clearing and Grubbing will be made. No additional payment will be made for extra handling of stockpiled topsoil made necessary by the use of the item for Road and Drainage Excavation (Additional Material).

The roadbed through rock cuts shall be constructed to the grading line shown on the Plans, with an allowable working tolerance of plus 1 to minus 3 in. (plus 25 to minus 75 mm). The portions of the roadway that are less than 3 in. (75 mm) below grade shall be brought to grade with spalls or other suitable granular material that is available from the excavation within the balance. If such excavation is not available, the Engineer may direct the Contractor to use approved base material for capping. Payment for furnishing and placing said base material will be made at the contract unit price bid per ton (metric ton) for the applicable Item in **Subsection 303.14**. When base material is not a bid item in the Contract, the material shall be furnished under the provisions of **Subsection 104.03**. If the roadbed is excavated in excess of 3 in. (75 mm) below the grading line shown on the Plans, the Contractor will be required to furnish and place at his own expense sufficient amounts of spalls or base material to bring the roadbed to a line 3 in. (75 mm) below the grading line.

Where sodding is indicated on the Plans to be placed on rock cuts, the rock shall be removed to 1 ft. (30 cm) below the grading line and backfilled to grade with earthen material prior to placing the sod. Measurement and payment of this work will be made under Items for Roadway and Drainage Excavation (Unclassified) and Sodding (New Sod).

All suitable materials removed from the excavation areas shall be used in the construction of embankments, intersecting road approaches, and in such other places as directed. Embankment construction shall be performed in accordance with the provisions of **Section 205** of these Specifications.

When boulder formations occur, the roadbed in the excavation area shall be scarified and all boulders removed to a depth of 12 in. (30 cm) below grade. The cavities thus formed shall be backfilled with suitable material and compacted.

All rock cuts shall be presplit at the outside limits of the cut areas. Presplitting shall consist of forming a plane of split rock prior to any primary blasting. The plane shall be formed for the entire depth of the cut or to a predetermined bench level. Presplitting shall be accomplished by drilling holes of appropriate size to the desired depth along the outside limits of the cut area, loading such holes with appropriate charges of explosives, stemming with minus 3/8 in. (9.5 mm) clean stone chips to the collar of the holes and detonating simultaneously. The initial horizontal spacing of holes and vertical spacing of charges and blasting cord for simultaneous detonation shall be as recommended by a reliable powder company. Adjustments of horizontal hole spacing and vertical spacing of

charges shall be made as necessary to obtain a relatively smooth shear plane. Sand, gravel, clay, or dirt will not be permitted for stemming. In drilling holes for presplitting, the drills shall be plumbed for vertical slopes or set on the required slope when other than vertical slopes are specified, and all holes shall be drilled in the same plane. Presplitting will not be required on slopes flatter than 1 to 1. After presplitting is done, the drilling of primary blast holes shall be kept at least 3 ft. (1 m) or more from the presplit face. Presplitting of rock cuts under bridge sites shall be in accordance with the provisions of this Subsection and hole spacing shall be as specified under **Subsection 204.08**. Blasting records shall be made available on request by the Engineer. Blasting shall not be permitted within 300 ft. (100 m) of any Structure or concrete until at least 72 hours have elapsed after placement of the concrete. The Contractor will be responsible and replace and/or repair any and all damages at no expense to the Department.

All loose rock on cut slopes shall be removed immediately. Excavation material shall not be wasted, deposited or disposed of outside the construction lines unless directed by the Engineer. Obliteration of old roadways shall include all grading operations necessary to incorporate the old roadway into the new roadway and surroundings in order to provide a pleasing appearance from the new roadway.

Removal of concrete pavement, base, parking strip, sidewalk, curb and gutter, etc. will be paid for under the classifications as prescribed in **Subsections 202.06 and 203.02(a)**. Roadway obliteration will be paid for as Road and Drainage Excavation (Unclassified).

When the Contractor's excavating operations encounter remains of prehistoric people's dwelling sites or artifacts of historical or archaeological significance, the operations shall be temporarily discontinued. The Engineer will contact archaeological authorities to determine the disposition thereof.

The Engineer shall designate as unsuitable those soils that cannot be properly compacted in embankments. All unsuitable soil shall be disposed of as directed at no additional cost.

When the location of unstable soil is shown on the Plans, its removal and replacement shall be as shown.

The Contractor shall notify the Engineer sufficiently in advance of opening any borrow area so that, after stripping, cross section elevations and measurements of the ground surface may be taken, and so that the borrow material can be tested before being used. At least 14 days' time shall be allowed for testing borrow materials or other material from roadside pits that is proposed for construction purposes.

Unless otherwise permitted, borrow material shall not be placed until after the roadway excavation has been placed in the embankments. If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume as measured in the borrow area. The Contractor shall not excavate beyond the dimensions and elevations established.

When the Contractor elects to remove highway fencing to obtain borrow materials, the fencing shall be replaced with new fence at the

Contractor's expense. The Contractor shall be responsible for the confinement of livestock when a portion of the fence is removed.

Borrow pits shall be excavated in such a manner that they will be self-draining where possible and practicable, and shall be of a shape that can be easily cross sectioned.

When the Contractor's excavation operations are completed the area shall have a neat appearance. All borrow areas, except those portions which are under water in the case of pits which are not self-draining, shall be covered with topsoil and seeded.

Furnishing and placing of topsoil and seeding (with mulch) shall be performed in accordance with the provisions of **Subsection 203.06** and **Section 801**, respectively.

Furnishing and placing topsoil and seeding of borrow areas, as specified above, will not be paid for directly, and the costs thereof will be included in the prices bid for other items of construction.

The Contractor's attention is called to **Sections 53-801 through 53-809** of the **Tennessee Code, Annotated**, the provisions of which apply to borrow pits 1 acre (4047 m²) or more in size that are not self-draining. Full information regarding the requirements to be complied with and the necessary permits which the property owner must secure for the construction of a pond, lake, borrow pits, etc., one acre or larger which is not constructed to drain, will be supplied upon application to the Tennessee Department of Environment and Conservation.

All existing roads within the right-of-way and not in the graded area that are to be abandoned shall be scarified, obliterated, top-soiled, and seeded. Scarifying and obliterating the pavement will not be measured and paid for directly, but the cost will be included in the cost of other items. Topsoil will be measured and paid as outlined in **Section 203.09** and **203.10**. Seeding, in accordance with **Section 801** of these Specifications, will be measured and paid for under the item for Seeding.

203.05-Undercutting. This work shall consist of the removal and disposal of unsatisfactory materials below grade in cut sections, and the removal and disposal of unsatisfactory material from areas upon which embankments are to be placed. It shall also include undercutting for pipe and box culverts where required.

Undercutting does not include the stripping, stockpiling and placing of topsoil, described in **Subsection 203.06**; neither does it include step benching in the preparation of embankment areas on hillsides, as provided for under **Subsection 205.03**.

Areas to be undercut will be designated on the Plans if appropriate information is available. However, the Engineer may increase, decrease, or shift such designated areas as conditions require as the construction progresses.

Undercut areas shall be backfilled with suitable material from within the grading balance, or in the first 1,000 ft. (300 m) of the adjacent balances if obtainable. If road and drainage excavation is not available, borrow excavation shall be used for backfilling.

The Contractor shall conduct his operations in such a manner that the Engineer can take the necessary cross sectional measurements.

Backfill materials shall be compacted as specified in **Section 205, Embankments.**

203.06-Stripping, Stockpiling and Placing Topsoil. The Engineer will designate areas between slope stake points in both cut and fill from which the existing topsoil shall be stripped and stockpiled. The quantity of topsoil to be stripped shall be sufficient to provide, over all areas to be seeded, a depth of 2 to 3 in. (50 to 75 mm) of the material. If the quantity of topsoil available in such areas is insufficient, the Contractor shall make up the deficiency with topsoil from a source outside the rights-of-way. The quantity of topsoil from such a source shall be measured by cross sectioning the area before and after removal.

The Engineer will designate areas to be deleted from stripping operations because of rock or other unsuitable material.

Prior to the stripping operation, the Contractor shall notify the Engineer in order that the latter may designate the areas on which the topsoil material will be stockpiled. The stockpile areas shall be located along the project at locations approved by the Engineer. Each stockpile, when completed, shall be neatly dressed so that they may be readily measured.

Immediately prior to the preparation of an area for seeding, the Engineer will cross section the stockpiles of material to be used in the operation. No stockpiles shall be cross sectioned or topsoil spread until the construction sequence for seeding has been established and is ready to proceed. A 2 to 3 in. (50 to 75 mm) layer of topsoil shall be placed where seeding is required except on cut slopes steeper than 2:1. On cut slopes steeper than 2:1 that are to be seeded, topsoil shall be spread to a depth of 1 to 2 in. (25 to 50 mm), as directed by the Engineer. Rock slopes and other rock areas which are to be seeded shall be capped with 9 in. (22.5 cm) of suitable material, plus 2 to 3 in. (50 to 75 mm) of topsoil. After the stockpiled topsoil has been placed as specified above, the areas upon which the topsoil was stockpiled shall be neatly dressed and final cross sections taken.

203.07-Disposal of Excess or Unsuitable Material. Excess excavation material shall be used to raise, widen or flatten the slopes of embankments; to fade embankments into cuts; or be placed in such other locations and for such purposes as the Engineer may direct.

Specific instructions will be given by the Engineer regarding the disposal of surplus material. Excess or unsuitable material placed within the rights-of-way limits shall be placed and compacted in accordance with **Subsection 205.04.** Foundation preparation for and drainage through these waste areas shall be equivalent to that provided for the adjacent roadway embankment.

If no suitable place can be found to dispose of excess or unsuitable material within the limits of the rights-of-way, the Engineer may direct the Contractor to provide a suitable site off the rights-of-way at no additional cost. Waste material (earth and rock) not required for the construction of the project will be disposed of by the Contractor. The Contractor will be required to obtain any and all necessary permits including, but not limited to, NPDES, Aquatic Resources Alteration Permits, Corps of Engineers

Section 404 Permits, and TVA Permits. The Contractor will provide copies of these approved permits prior to commencement of any work. Excess or unsuitable material placed off the rights-of-way shall be disposed of as follows:

When waste material is placed contiguous to the rights-of-way, the requirements for its disposal shall be the same as noted above for waste areas on the rights-of-way. An exception to these requirements may be granted for excess or unsuitable material placed contiguous to the rights-of-way provided the Engineer approves a different procedure based on a geotechnical investigation of the proposed waste area, made by an approved geotechnical engineering firm retained by the Contractor.

Neither a waste area plan nor a geotechnical investigation will be required for excess or unsuitable material placed in waste areas off the rights-of-way which, in the judgment of the Engineer, are so removed from the rights-of-way as to not constitute a potential threat to the stability of the project provided that:

1. The slope of the existing ground in the proposed waste area site is not steeper than 4:1.
2. The height of the waste area embankment does not exceed 40 ft. (12 m).
3. The side slopes of the waste area are constructed on a 2:1 slope or flatter, except waste rock may be placed on a 1-1/2:1 slope where approved by the Engineer.

When the waste area does not meet all of criteria (1), (2) and (3) above, the following requirements apply:

- (a) The excess or unsuitable material shall be placed and spread in horizontal layers not to exceed 10 in. (25 cm), except excess rock material may be placed in the waste area in layers not exceeding 3 ft. (1 m) in depth. Rock greater than 3 ft. (1 m) in diameter may be placed in the perimeter of the waste area provided the Contractor's plan for placing the oversized rock is approved in writing by the Engineer. Side slopes of material in waste areas shall be 2:1 or flatter, except side slopes of waste rock material may be 1-1/2:1 when approved by the Engineer.
- (b) The Contractor shall submit a plan of each waste area for approval of the Engineer showing:
 1. The location and limits of the area.
 2. The original and proposed ground contours.
 3. The proposed foundation preparation including benching where the waste material will be deposited on slopes steeper than 4:1.
 4. The proposed drainage through and/or around the waste area.

5. The estimated quantity of waste material in cubic yards(cubic meters).
 6. An erosion control plan for the construction of the waste area.
- (c) The placement procedures in (a) above may be waived provided the Engineer approves a different placement procedure based on a geotechnical investigation conducted by an approved geotechnical engineering firm retained by the Contractor. The geotechnical investigation shall include the geologic conditions, boring logs, materials and strength parameters, stability analysis and proposed design and construction requirements.

When shown on the Plans, the geotechnical investigation of waste areas described in paragraph (c) above, shall be a requirement, not an option of the Contractor. A minimum safety factor will be included on the plans for this case.

The Contractor shall not dispose of any material either on or off the R.O.W. in a regulatory floodway as defined by the Federal Emergency Management Agency without approval by same. All material shall be disposed of in upland (non-wetland) areas and above ordinary high water of any adjacent watercourse. This does not eliminate the need to obtain any other licenses or permits that may be required by any other Federal, State or local agency.

All waste areas shall be approved in writing by the Engineer prior to placement of any waste material.

All costs associated with the disposal of excess or unsuitable material in waste areas shall be borne by the Contractor unless otherwise specified on the Plans.

Waste areas that are formed by the disposal of excess or unsuitable material outside of the construction limits shall be covered with topsoil and seeded. Furnishing and placing the topsoil and seeding (with Mulch) shall be performed in accordance with the provisions of Subsection 203.06 and Section 801, respectively.

Furnishing and placing topsoil and seeding waste area inside the Rights-of-Way shall be measured and paid for at the contract unit prices bid for the respective items. Furnishing and placing topsoil and seeding on waste areas outside the Rights-of-Way in accordance with the above provisions will not be paid for directly, and the costs thereof shall be included in the unit price bid for other items of construction.

203.08-Sloping, Shaping and Dressing. The slopes of all excavated areas, ditches, waterways, channels, borrow pits and embankments shall be so trimmed and shaped as to be in reasonably close conformity with the cross sections shown on the Plans or as directed by the Engineer.

Rock cuts shall be scaled of all loose fragments, projecting points, etc. and left in a neat, safe and workmanlike condition.

Excess material created by trimming slopes, resloping, and shaping shall be disposed of as stipulated in **Subsection 203.07** of these Specifications.

Final Dressing shall be performed in accordance with the provisions of **Section 206.**

COMPENSATION

203.09-Method of Measurement. Road and Drainage Excavation will be computed by the cubic yard (cubic meter). All accepted excavation including borrow shall be measured in its original position by cross sectioning the area excavated. At the option of the Engineer, cross sections may be determined from conventional manual surveys, aerial surveys, Digital Terrain Modeling, or a combination of the 3 methods. Hauling of excavation and borrow materials shall be considered incidental to the construction and the costs thereof shall be included in the unit price bid for excavation items.

Excavation required to bench side-hill slopes of embankment construction will be measured for payment in accordance with the following requirements:

- (a) Excavation in Solid Rock.
 - 1. Will be paid for as Road and Drainage Excavation (Unclassified) whether the excavation material is bladed and dozed or picked up and hauled.
- (b) Excavation other than Solid Rock.
 - 1. Excavated material that is picked up and hauled will be paid for as Road and Drainage Excavation (Unclassified).
 - 2. Excavation material that is moved by blading or dozing will not be paid for directly but the cost shall be included in the contract price for other items of work.

Authorized excavation of rock, shale, or unsuitable material below grade shall consist of that excavation necessary to provide the designed thickness of backfill. If the plane of the designated bottom of excavation falls within a layer or stratum of rock, the below-grade excavation to the bottom of the layer, not exceeding 3 in. (75 mm) below grade, will be considered as authorized and will be measured for payment. If the roadway is excavated in excess of 3 in. (75 mm) below the grading line shown on Plans, the Contractor will be required to furnish and place at his own expense sufficient amount of spalls or approved base course material, or other suitable approved granular material to bring the roadway to a line 3 in. (75 mm) below the grading line.

Rock cuts which have been presplit in Road and Drainage Excavation (Unclassified) and Channel Excavation (Unclassified) shall be measured and paid for by the square yard (square meter). The quantity of presplitting shall be the s.y. (m²) of rock face as determined by the difference in elevation in yards (meters) between the bottom and top of face, multiplied by the length of face in yards (meters). The quantity of presplitting shall be the square yards (square meters) of rock face as determined by the

difference in elevation in yards (meters) between the bottom and top of face at each station and intermediate stations (where break sections are needed to accurately show the work) multiplied by the length of face in yards (meters) taken from cross sections.)

When a contract does not have an item for presplitting the required presplitting will not be paid for separately, but shall be included in the price bid for either Road and Drainage Excavation or Channel Excavation (Unclassified).

Measurements will be made for unsuitable materials excavated and removed to obtain proper compaction in cut sections, in foundations for fill sections and that required for pipe and box culverts as described in **Subsection 204.12**. The removal and disposal of this unsuitable material will be classified as "Undercutting," unless otherwise designated.

No measurement will be made of suitable material temporarily removed and replaced to facilitate compaction of the material for the full depth shown on the Plans.

Where it is impractical to measure material by the cross section method due to the erratic location of isolated deposits, acceptable methods involving three-dimensional measurements may be used.

Borrow excavation will be measured and paid for by the cubic yard (cubic meter) in accordance with **Section 109**, Measurement and Payment.

Water used in the Work will be measured by the M. G. (1,000 gal.) (m³) by means of calibrated tanks or distributors, or by means of accurate water meters.

Where excavation of different classifications overlap, the following order of measurement and computation for payment is designated as a contract provision, namely:

- Road and Drainage Excavation (Unclassified) or Channel Excavation (Unclassified) shall supersede Structure Excavation and Foundation Preparation. Road and Drainage Excavation (Unclassified) shall supersede Channel Excavation (Unclassified).
- Excavation, the cost of which is included in lump sum items or unit price bid for other items of construction, shall supersede all other classifications.

Excavation of embankment will not be measured for payment unless said excavation is specifically ordered in writing by the Engineer.

Stripping and stockpiling of topsoil will be measured by the cubic yard (cubic meter) in its original position, and except for topsoil obtained from a source outside the rights-of-way limits, paid for as unclassified excavation. Placing and spreading of stockpiled topsoil on slopes and elsewhere shall be measured by the cubic yard (cubic meter) in the stockpile by the cross section method. Furnishing and Spreading Topsoil obtained from a source outside the rights-of-way shall be measured by the cubic yard (cubic meter) in accordance with the provisions of **Subsection 203.06**.

Undercutting shall be measured by the cubic yard (cubic meter) on the basis of cross sectional measurement, or the most feasible method.

Overhaul of Road and Drainage Excavation (Unclassified), Road and Drainage Excavation (Additional Material), or Channel Excavation (Unclassified), unless otherwise specified, shall be measured and paid for by the station-yard (100 m- m³). The quantity of overhaul in station-yards, measured for payment, will be the product of the number of cubic yards of excavation hauled a distance greater than the free haul distance multiplied by the overhaul distance in stations of 100 linear feet (The quantity of overhaul in 100 meter-cubic meters, measured for payment, will be the product of the number of cubic meters of excavation hauled a distance greater than the free haul distance multiplied by the number of 100 meter segments in the overhaul). The overhaul distance is defined as the total distance the material is hauled from the center of gravity of the remaining mass of excavation to the center of gravity of the remaining mass of embankment, as measured along the center line of the main roadway, minus the free haul distance. For material that is obtained and placed within the limits of the same balance as shown on the plans or as adjusted by the Engineer according to **Subsection 203.04**, the entire length of the balance shall be considered the free haul distance and no payment of overhaul will be made. If the Engineer requires the Contractor to haul material from one balance to any other balance, the free haul distance will be considered as 2,500 ft. (750 m). No allowance will be made for any lateral haul distances. The Engineer will not require the Contractor to haul material from one balance to another balance unless the cost of overhaul is less than the cost of Borrow Excavation.

When the Plans specify or the Engineer directs that rock embankment material be obtained from the roadway excavation, all costs of constructing the rock embankment material, including, but not limited to, excavating, reserving, hauling and placing, shall be measured and paid for under the item for Road and Drainage Excavation (Unclassified) and no additional compensation shall be allowed for this work.

203.10-Basis of Payment. The accepted quantities of the items listed below will be paid for at the contract price per unit of measurement for each of the pay items that is listed in the bid schedule.

The item for, Road and Drainage Excavation (Additional Material) will be paid for at a rate per cubic yard (cubic meter) equal to 1.5 times the unit price bid for the item for Road and Drainage Excavation (Unclassified).

Undercutting, will be paid for at the contract unit price per cubic yard (cubic meter), except when no contract unit price has been established for , Undercutting, it will be paid for at a rate per cubic yard (cubic meter) equal to 1 1/2 times the contract unit price for Road and Drainage Excavation (Unclassified).

Overhaul, will be paid for at a rate per Station-yards (100 m- m³) equal to 4 % of the unit price bid for Road and Drainage Excavation (Unclassified) or 4 cents whichever is less. Overhaul, will be paid for at a rate per Station-yard (100 m- m³) equal to 1% of the unit price bid for Road and Drainage Excavation (Unclassified) or 1 cent whichever is less.)

**SECTION 204-STRUCTURE EXCAVATION
FOUNDATION PREPARATION, AND BACKFILL**

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SECTION 204-STRUCTURE EXCAVATION, FOUNDATION PREPARATION AND BACKFILL

204.01-Description. Structure Excavation and Foundation Preparation shall consist of necessary excavating, removal, and satisfactory disposal of all material within the limits hereinafter stipulated, and preparing the foundation for the installation or construction of bridges, culverts, underdrains, and other structures not otherwise provided for by the Specifications, all in accordance with these Specifications and in reasonably close conformity with the lines, grades and typical cross sections shown on the Plans or established by the Engineer.

This work shall also include the construction and subsequent removal of all bracing, shoring, cribbing, cofferdams, etc., all pumping and bailing, all backfilling, and the disposal of excess or unsuitable material.

204.02-Classification. Structure Excavation and Foundation Preparation will be classified and paid for under the following designations:

- (a) Culvert Excavation (Unclassified).
Structure Excavation and Foundation Preparation performed within the limits stipulated in **Subsection 204.08** and **204.10**, for all box bridges, pipe culverts, sewers, conduits, all other culverts, all minor structures of any type and description, will not be measured and paid for directly but the cost will be incidental in other items, unless otherwise noted on the Plans.
- (b) Dry Excavation (Bridges).
Structure Excavation and Foundation Preparation performed above the datum line (established by elevation and definitely set out on the Plans) and within the limits stipulated in **Subsection 204.08(a)** and **204.10(a)** and not classified as Rock Excavation (Bridges), as indicated or directed, will be classified and paid for as Dry Excavation (Bridges).
- (c) Wet Excavation (Bridges).
Structure Excavation and Foundation Preparation performed below the datum line (established by elevation and definitely set out on the Plans) and within the limits stipulated in **Subsections 204.08(a)** and **204.10(a)** and not classified as Rock Excavation (Bridges), as indicated or directed, will be classified and paid for as Wet Excavation (Bridges).
- (d) Rock Excavation (Bridges).
Structure Excavation and Foundation Preparation performed either above or below the datum line (established by elevation and definitely set out on the Plans) and within the limits stipulated in **Subsections 204.08(a)** and **204.10(a)** and consisting of material which cannot be economically excavated without the use of explosives, also any boulder, slab, or fragment of rock having a volume of not less than 1/2 C.Y. (m³), all portland cement

concrete, all masonry (dry mortar), as indicated or directed, will be classified and paid for as Rock Excavation (Bridges).

Cemented gravel, cemented chert, soft shale, or soft slate, even though requiring the use of explosives for economical excavation, will not be classified as rock.

(e) Bridge Excavation (Unclassified)

Bridge Excavation (Unclassified) shall be structure excavation and foundation preparation performed either above or below the datum line (established by elevation and definitely set out in the plans) as stipulated in **Subsection 204.08(a)** and **204.10(a)** regardless of the nature of the material excavated.

(f) Rock Drilling (Bridges).

Rock Drilling as herein set out covers the drilling or sinking of test holes through or in rock in order to verify the condition of the foundation.

(g) Bedding Material for Support for Pipe Culverts.

Class A-Portland Cement Concrete, Class A.

Class B-Specially selected granular soil.

MATERIALS

204.03-Foundation Fill Material. Material for foundation fill shall consist of suitably graded sand, gravel, slag or stone, as approved by the Engineer.

204.04-Bedding Material. Material for Class B bedding for pipe culverts shall consist of sand or a natural sandy soil, all of which passes a 3/8-in. (9.5 mm) sieve and not more than 10% passes a No. 200 (75 μ m) sieve, or stone, gravel, chert or slag meeting the grading requirements for either Grading C, D, or E of **Subsection 903.05**.

In rock cuts or other areas designated by the Engineer where a free drainage bedding or backfill material is required, the material shall be crushed stone, crushed slag, or washed gravel meeting the requirements of **Subsection 903.17**.

204.05-Concrete. Concrete shall conform to the requirements of **Section 604** (Concrete Structures). Unless otherwise shown on the Plans or in the Special Provisions, Class A concrete shall be used for foundation seals and shall meet the requirements of **Subsection 604.19**. Concrete for culvert pipe cradles shall be Class A.

204.06-Backfill Material. Material for backfill shall be fine compatible soil selected from structure excavation if approved by the Engineer as being suitable. Additional material needed shall be obtained from roadway or borrow excavation as described in **Section 203**.

Granular Backfill Material for Structures shall be Type A aggregate, Grading D meeting the requirements of **Subsection 903.05**.

When required by the plans, backfill material shall be a controlled low strength material (CLSM) (flowable fill) placed at locations shown on the plans or as directed by the Engineer.

Materials used in the placement of (CLSM) (flowable fill) shall meet the following requirements:

<u>Material</u>	<u>Subsection</u>
Fine Aggregate	903.01(f)
Portland Cement, Type I	901.01
Fly Ash, Class C or Class F	918.31
Ground granulated blast furnace slag (GGBFS)	918.32
Water	918.01
Chemical Additives	918.09
Air Entraining Admixtures	918.09

As defined herein, there are three (3) types of CLSM: general use flowable fill, excavatable flowable fill, and early strength flowable fill.

(a) General Use flowable fill: When not otherwise specified in the plans, or Contract, all flowable fill shall be general use and shall be proportioned to meet the following:

Property	Specification Limit
Load Application (ASTM D6024)	24 hours maximum in any condition
Consistency	8 in. (20 cm) min. tested in accordance with the below

The above proportions may be adjusted by the Engineer to obtain the consistency required for satisfactory flow. Consistency shall be determined as follows:

Place an open-ended cylinder (pipe) 3 in. (75 mm) in diameter by 6 in. (15 cm) in height in an upright position on a smooth, level surface. Fill the cylinder with a representative sample of the flowable fill proposed for use. Remove the cylinder by lifting it straight up thus allowing the sample to diffuse on the smooth, level surface. The flowable fill should diffuse into a circular shape having an approximate diameter of not less than 8 in. (20 cm).

Each consistency test shall represent up to 100 C.Y. (m³) of flowable fill at each installation.

(b) Excavatable flowable fill (EFF) – When specified on the plans, an EFF shall be designed, proportioned, and delivered to the project meeting the following performance requirements:

Property	Specification Limit
Air content (ASTM D 6023)	Maximum 30 % ¹
Load Application (ASTM D6024)	24 hours maximum in any condition
Consistency	8 in. (20 cm) min. as tested in (a)
Compressive strength (ASTM D 4832) ²	30-psi(207kPa) minimum at 28-days
Compressive strength (ASTM D 4832) ²	140-psi(965kPa) maximum at 98-days

1- when using air entrained mixture design

2- ASTM D 4832- 4 x 8 in. (10 x 20 cm)cylinder molds may be used. The preferred capping method to be used is wet suit neoprene restrained in rigid retainers. Specifiers should be aware that EFF designs will take longer periods of time to have sufficient bearing strength before backfilling is allowed.

The ready mix producer must complete a test trench (at least 3 ft. wide x 3 ft. deep x 8 ft. long(1 m wide x 1 m deep x 2.4 m long)), during the mixture design process, with the proportioned materials to demonstrate the mixture will meet the performance criteria. The mixture design may be adjusted with approval by the Engineer to obtain the required properties.

(c) Early strength flowable fill (ESFF)- When specified on the plans ESFF shall be designed, proportioned, and provided that meets the following performance specifications:

Property	Specification Limit
Air content (ASTM D 6023)	Maximum 30% ¹
Load Application (ASTM D6024)	6 hours maximum in any condition
Consistency	8 in. (20 cm) min. as tested in (a)
Compressive strength (ASTM D 4832) ²	30-psi(207kPa) minimum in 24-hours

1- When using air entrained mixture design

2- ASTM D 4832- 4 x 8 in. (10 x 20 cm)cylinder molds may be used. The preferred capping method to be used is wet suit neoprene restrained in rigid retainers.

The proportions of ESFF shall include sufficient amounts of cementitious materials, high range water reducers, accelerators, and other chemical admixtures so the ESFF can be loaded/backfilled as specified.

The ready mix producer must complete a test trench at least 3 ft. wide x 3 ft. deep x 8 ft. long (1 m wide x 1 m deep x 2.4 m long), during the mixture design process, with the proportioned materials to demonstrate the mixture will meet the performance criteria. The mixture design may be adjusted with approval by the Engineer to obtain the required properties.

The Contractor shall furnish certification that all flowable fill delivered to the project has been batched in accordance with the approved mixture design and meets the designated properties as specified. Chemical Additives and/or Air Entraining Admixture may be used to produce the desired consistency with no additional payment to be made for such additives.

EQUIPMENT

204.07-Equipment. All equipment necessary for the satisfactory performance of this work shall be on the project, and approved, before work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

204.08-Excavation.

- (a) Bridges, Box Culverts and Other Major Structures.

Before excavation is started the Engineer or Contractor when required, will set stakes locating and outlining the structure and cross section for excavation computations. No excavation shall be started prior to that time.

All structure excavation shall be cut to the lines and elevations indicated on the Plans, or as directed by the Engineer. Working variations outside the neat lines will be permitted; however, only that excavation outlined under **Subsection 204.12** will be measured for payment.

No excavated materials shall be deposited or disposed of outside the construction lines unless directed by the Engineer.

When solid rock is encountered in roadway cut sections and channel sections under bridges, presplitting operations shall be performed in accordance with the provisions of **Subsection 203.04**. Hole spacing along bridge abutment sites shall not exceed 12 in. (30 cm). Where overshooting of rock, beyond the cut sections shown on the bridge plans cause modification of bridge abutments or span lengths, such modifications shall be made at the contractor's expense.

Inclined surfaces of rock used as foundation shall be excavated either level or in steps. When necessary, as determined by the Engineer, to obtain good bond, the surface of rock

foundation shall be roughened, or suitable anchors installed. Over-excavations that require re-design, or increased bridge length and/or quantities, or supplemental retaining walls or other earth retaining structures shall be paid at the expense of the Contractor.

Existing concrete foundations, boulders, or ledge streaks of rock projecting into the bottom of the excavation shall be removed to a depth of 6 in. (15 cm) below foundation elevation, and the space backfilled with approved material and thoroughly compacted.

Excavation below bridge foundation elevations as given shall be done only upon direction of the Engineer. All materials moved without such authority shall be replaced by the Contractor without compensation by constructing a sub-footing of the same materials as the footing of the structure unit and 6 in. (15 cm) wider on every side.

(b) Pipe Culverts.

In addition to any of the foregoing provisions that are applicable, the following procedures will be required:

In excavating for pipe culverts, the width of the pipe trench shall be as identified in the plans to permit satisfactory jointing of the pipe, thorough tamping of the bedding material under and around the pipe, and for placement of flowable fill.

When rock, hardpan or other unyielding material is encountered in the pipe trench, it shall be removed below the foundation grade for a depth of 6 in. (15 cm), or as directed by the Engineer.

(c) Utilization of Excavated Materials.

All suitable excavated material shall be utilized as backfill or embankment. Excess or unsuitable material shall be disposed of in such a manner as not to obstruct the stream or otherwise impair the efficiency or appearance of the structure. No excavated material shall be deposited at any time in such a manner as to endanger a partly finished structure.

The Contractor shall handle and deposit excavated materials in such a manner as to furnish proper protection to materials which will be incorporated in the structure.

In streams the disposal of material will be subject to the laws of the U.S. Government and requirements set out in the standard permit form of the applicable government agency approving the location and Plans, and authorizing the construction of the structure.

204.09-Protection of Excavation. The Contractor will be held responsible for protecting his excavation and shall take every precaution to maintain the excavation intact.

Cofferdams or cribs, used in the preparation and protection of the foundation, in general, shall be carried well below the bottom of the footings, shall be substantially braced in all directions; and shall be of such

construction as will permit them to be pumped and maintained free of water until the construction therein has been completed. Unless otherwise specifically indicated on the Plans, the interior dimensions of the cofferdam will be such as to give sufficient clearance to provide for the construction and inspection of forms; and to provide for the handling and pumping of leakage outside of the footing area. Cofferdams or cribs which tilt or move out of position during the process of sinking shall be righted or enlarged in order to provide the necessary clearance.

Cofferdams or cribs shall be so constructed as to protect the foundation and the construction therein against damage from a rise in the stream.

Timber, or bracing of a cofferdam or crib may extend into or through the substructure only with the written permission of the Engineer, obtained before the construction of the cofferdam or crib has been started. In addition, the cofferdams for structure widening shall not be braced off of the existing structure.

The Contractor shall submit drawings, prepared by and stamped by a Professional Engineer licensed in Tennessee, showing details of his proposed cofferdam, or crib construction to the Engineer, prior to starting any work. The type and clearance of cofferdams, or cribs, insofar as they affect the finished structure or part thereof, will be subject to the approval of the Engineer but the design and successful construction shall be the responsibility of the Contractor.

Cofferdams or cribs, with all falsework, sheeting, bracing, etc. shall be removed by the Contractor after the completion of the sub-structure therein, unless otherwise directed. The removal shall be affected in such a manner as not to disturb nor mar the completed work.

If the foundation excavation has become disturbed or distorted, it shall be cleaned out and restored to satisfactory condition at the Contractor's expense.

204.10-Foundation Preparation.

(a) Bridges, Box Culverts, and Other Major Structures.

The preparation of foundations for bridges, box culverts and other major structures, in addition to the stipulations set out in **Subsections 204.08** and **204.09**, shall be in accordance with the following:

When the foundation has been completed to foundation elevation as given, the Engineer shall be notified and the construction therein withheld pending his inspection and approval of the foundation.

When directed by the Engineer, unless piles are indicated, the Contractor shall test each foundation in the presence of the Engineer, by sinking not less than 3 holes, or more than 6 holes to a depth of between 6 and 10 ft. (1.8 and 3 m) in order to verify the apparent conditions of the foundations.

Should these test holes disclose unsatisfactory foundation conditions, the excavation shall be carried lower, as directed by the Engineer, and new tests made, until a satisfactory foundation is secured. The costs incurred in sinking test holes will not be paid

for directly but shall be included in the price bid for other items of construction unless specified otherwise on the Contract drawings.

When rock is encountered in the excavation for the foundation, it shall be cleared off and the Engineer notified. Test holes shall then be drilled in the rock as shown on the Plans or directed by the Engineer to determine the lines of demarcation, the classification and the stability of the rock. The excavation shall then be continued to the elevation designated by the Engineer and test holes, if required by the Engineer, shall again be drilled and excavation continued until a foundation approved by the Engineer is secured.

Rock used as foundation shall be stripped and cleaned of all overlying materials. All loose, disintegrated, or light slabby portions of the rock shall be removed.

In rock foundations, when the rock is shattered below the foundation elevation, the shattered material shall be removed and the space so created rebuilt with the same type of construction as the proposed overlying construction. The additional quantities thus made necessary shall not be included in the pay quantities for this item.

When the Plans indicate that piles shall be driven, or if after the foundation excavation has been completed it becomes necessary to reinforce the foundation by driving piles therein, any bulge of the foundation material, caused by the driving of the piles, shall be removed at the Contractor's expense, to the elevation indicated or directed and the foundation trued to an even surface over its entire area.

Unsatisfactory material in the foundation shall be removed and replaced with satisfactory material designated by the Engineer. This material shall be placed in layers not exceeding 6 in. (15 cm) in loose depth and compacted to 100 % of maximum density up to the foundation elevation.

Any pumping that may be permitted from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of any portion of concrete material being carried away. Any pumping required during the placing of concrete, or for a period of at least 24 hours thereafter, shall be done from a suitable sump located outside the concrete forms.

When conditions are encountered which render it impracticable to dewater the foundation before placing the footing, the Engineer may permit the construction of a concrete foundation seal of such dimensions as he may consider necessary and of such thickness as to resist any possible uplift. Before pouring the seal, the foundation shall be cleaned of all objectionable material by the use of sand pumps, spud bars or other means which will accomplish the purpose satisfactorily. The seals shall then be constructed in accordance with the provisions of **Subsection 604.19**. Pumping to dewater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure. The foundation shall then be dewatered and

the seal thoroughly cleaned of all laitance and generally prepared for further construction.

Measurement and payment for concrete foundation seal will be as provided for under **Subsections 604.31** and **604.32** except as provided for in 204.13.

(b) Pipe Culverts.

Bedding for pipe culverts shall conform to the requirements given below for Class A, B, or C bedding, whichever is shown on the Plans or in the special provisions. If the class of bedding is not shown, Class C bedding shall be placed.

Class A bedding for pipe culverts shall consist of a continuous concrete cradle constructed in conformity with the details shown on the Plans and the applicable requirements of **Section 604** (Concrete Structures).

Class B bedding shall be constructed by bedding the culvert pipe in a trench cut in natural ground or compacted embankment to a depth as shown on the Plans. The pipe shall be bedded on a 6 in. (15 cm) thickness of Class B Material and sufficient additional Class B material accurately shaped by a template to fit the lower part of the pipe exterior for at least 10% of its overall height. Class B material shall then be rammed and tamped in layers not over 6 in. (15 cm) in loose thickness around the pipe to a minimum depth of that shown on the Plans. The remaining depth of trench shall then be backfilled and compacted as outlined in **Subsection 204.11(b)**. When bell and spigot pipe is to be placed, recesses shall be dug in the bedding material of sufficient width and depth to accommodate the bell without its resting on the bottom of the recess. The width of the recess shall not exceed the width of the bell by more than 2 in. (50 mm).

Class C bedding shall be constructed by bedding the culvert pipe in a shallow trench cut in natural ground or compacted embankment to a depth of not less than 10% of the outside vertical pipe diameter, and shall be shaped to fit the lower pipe exterior for the specified embedment. When bell and spigot pipe is to be placed, recesses shall be dug in the earth foundation of sufficient width and depth to accommodate the bell without its resting on the bottom of the recess. The width of the recess shall not exceed the width of the bell by more than 2 in. (50 mm).

When flowable fill is required by the plans, class B bedding shall be constructed by bedding the culvert pipe in a trench cut in natural ground or compacted embankment to a depth as shown on the Plans. The pipe shall be bedded on a 6 in.(15 cm) thickness of Class B Material and sufficient additional Class B material accurately shaped by a template to fit the lower part of the pipe exterior for at least 10 % of its overall height. Flowable fill shall then be placed around the pipe as specified in **Subsection 204.11(c)**.

204.11-Backfilling. General. All backfill, other than flowable fill if called for on the plans, that becomes a part of the roadway prisms or their foundations shall be placed in layers and compacted to 100% density in accordance with the provisions of **Section 205**, Embankments. Flowable fill shall be placed in accordance with **Subsection 204.06**

(a) Bridges, Box Culverts and Other Major Structures.

All areas which have been excavated, the volume of which is not occupied by the structure, shall be refilled with acceptable earth material to the normal ground surface, unless otherwise directed. This backfill shall be accomplished by building up in layers, not more than 6 in. (15 cm) in loose depth for mechanical tamps and 10 in. (25 cm) in loose depth for tamping rollers, on both sides of the structure or around the structure unit, maintaining the layers at equal elevation and thoroughly compacting each layer by tamping with suitable rapid-striking power-driven mechanical tampers or sheepsfoot rollers before the succeeding layer is placed.

Granular Backfill Material for Structures (Class A Grading D) will be placed such that the compacted depth shall not exceed 6 in. (15 cm) per layer. Density requirements will be 100% with testing performed on every 6 in. (15 cm) layer.

When any part of the structure is to function as a retainer for backfill, such as abutments, retaining walls, wing walls, arches, side walls of box culverts, or minor structures, the boundary slopes shall be stepped in order to prevent any wedge action.

Backfill shall not be placed against a structure or a section or unit thereof, until the work described under **Subsection 604.20** (Removal of Forms) and **604.22** (Finishing Concrete Surfaces) has been performed and representative specimens of the concrete in the structure, section or unit, cured by the methods and in the manner the concrete which the test specimens represent is cured, attain a compressive strength of 3,000 psi (20.7 MPa). In addition to the above requirements the concrete shall have been placed a minimum of 7 days, not counting the days of 24 hours each in which the temperature falls below 40°F (4°C), or 21 calendar days, whichever occurs first. Backfill behind abutments held at the top by a superstructure, and behind the sidewalls of culverts, shall be carried up simultaneously behind abutments or sidewalls.

Box culverts and bridge ends shall be backfilled promptly after and as permitted by the strength requirements notes above, but no longer than 30 days following strength attainment, and before placing a bridge deck, or as directed by the Engineer.

(b) Pipe Culverts.

After the bedding has been prepared and the pipe installed, the trench shall be backfilled with bedding material and/or fine compactable soil selected from excavation or borrow in accordance with the Plans. Prior to backfilling concrete pipe, the joints shall be cured in accordance with the provisions of **Subsection 607.07**. The material shall be placed along each side

of the pipe in layers not over 6 in.(15 cm) in loose depth. Each layer shall be moistened or dried, if necessary, to near optimum moisture content and thoroughly compacted with mechanical tampers. Special care shall be taken to compact thoroughly the material under the haunches of the pipe and to insure that the backfill material is in intimate contact with the side of the pipe. The backfill shall be brought up evenly on both sides of the pipe for the full required length. Except as may be required where the imperfect trench method is prescribed, the backfill material shall be placed for the full depth of the trench.

When the top of the pipe is above the top of the trench, embankment material shall be placed and compacted in layers not more than 6 in. (15 cm) in loose depth for a width on each side of the pipe equal to at least twice the horizontal inside diameter of the pipe or 12 ft. (3.5 m), whichever is less. The embankment on each side of the pipe, for a distance equal to the horizontal inside diameter of the pipe, shall be of the same material and compacted in the same manner as required for backfill in the foregoing paragraph. The remainder of the fill material shall be soil which can be readily compacted and shall contain no frozen lumps, chunks or plastic clay, stones that would be retained on a 3-in. (75 mm) sieve, or other objectionable material. It shall be compacted as required for backfill or by rolling in accordance with the applicable requirements of **Section 204**. The embankment shall be placed evenly on both sides of the pipe for the full width of the roadbed up to an elevation a minimum of 1 ft. (30 cm) above the top of the pipe. Above this elevation, and also above the top of a backfilled trench that is 1 ft. (30 cm) or more above the top of the pipe, embankment shall be placed in accordance with the applicable requirements of **Section 205**, except those requirements where the imperfect trench method is prescribed.

When the imperfect trench method is required by the Plans, the pipe shall be bedded, the trench backfilled, and the embankment placed, as prescribed above, to a height above the top of the pipe equal to the vertical outside diameter of the pipe plus 1 ft. (30 cm). A trench equal in width to the outside horizontal diameter of the pipe shall then be excavated in the newly placed backfill or embankment directly over the pipe, keeping the trench walls as nearly vertical as possible, and down to an elevation 1 ft. (30 cm) above the top of pipe. The lower 1/4 of the trench shall be backfilled with straw or other highly compressible material and the remainder of the trench backfilled with the excavated trench material deposited in the loosest possible manner. After the trench backfill has been completed, the remainder of the embankment shall be constructed by normal methods to the finished grade line.

When the material specified in **Subsection 903.17** is used for Class B bedding, the compaction and density requirements will be waived. The height of the lift may be increased up to a maximum of 3 ft. (1 m) after the material has been thoroughly forced under the haunches of the pipe.

(c) Backfill Material (Flowable Fill).

Flowable fill shall be placed at locations shown on the plans or as directed by the Engineer. The flowable fill shall be covered or otherwise protected while in the plastic state. No embankment or base shall be placed on the flowable fill prior to final set or hardening as determined by the Engineer.

Prior to placement of the flowable fill, pipe and bedding shall be installed in accordance with the **Standard Specifications** and with details shown on the Plans. All sections of pipe shall be securely braced or anchored both horizontally and vertically, if necessary, to prevent movement of the pipe during placement of the flowable fill. Pipe sections shall be joined so as to prevent the influx of flowable fill around the joints. The Contractor shall replace at his expense any pipe or sections of pipe which do not conform to the above requirements. The contractor shall also make provisions to form up, or provide earthen berms to prevent the flowable fill from escaping at the ends of the trench and around headwalls.

COMPENSATION

204.12-Method of Measurement. Structure excavation will be measured by the C.Y. (m³) in its original position only.

Water and its removal will not be measured as it is a necessary part of the work.

Excavation below foundation elevation, as indicated or as directed, by the Engineer, will be measured and computed for payment provided the cause which made this extra excavation necessary is not attributable to the Contractor.

No allowance will be made for excavation necessary in connection with the construction of box bridges, box culverts, retaining walls or minor structures, including pipe culverts and sewers, unless otherwise indicated on the Plans, except that undercutting for these structures made at the direction of the Engineer to remove unsuitable foundation material will be classified and paid under the item for Undercutting, as provided in **Section 203**.

When the Plans provide for direct payment of excavation, necessary in connection with the structures enumerated in the preceding paragraph, the excavation, including any undercutting made at the direction of the Engineer to remove unsuitable foundation material, will be classified and paid as the item for Culvert Excavation (Unclassified) with the following exception:

Excavation within the limits of box bridges, box culverts with a bottom width between the inner faces of the outside walls greater than 14 ft.,(4 m), that is performed above the flow line of the structure, and with a bottom width equal to the distance between the inner faces of the outside walls on a 1:1 slope to the normal ground surface, will be

measured and paid for under the Item for Channel Excavation (Unclassified).

Material used to replace approved undercutting for box bridges, box culverts, retaining walls or minor structures, including pipe culverts and sewers, will be paid under the item for Foundation Fill Material, and the measurement will be the same quantity as the approved undercutting it replaces.

Materials excavated prior to the necessary measurements having been obtained by the Engineer cannot be measured in their original position and therefore will not be computed for payment.

Slides, cave-ins, and excavation extending outside of the workable limits will not be computed for payment.

Material in a foundation which has bulged due to the driving of piles and which must be removed will not be measured or computed for payment.

No excavation above the normal ground surface will be measured for payment, unless otherwise shown on the Plans.

The normal ground surface, as used in this Section, is defined as the bottom of channel excavations when channel excavation is indicated in the contract documents, the template section of the roadway in cuts, or the natural ground surface, whichever is at the lower elevation. When it is required that the structure excavation be made in new embankment, the normal ground surface shall be the planes of the new embankment at the elevation specified or directed for construction in advance of performing the required structure excavation, but in no case shall the normal ground surface be above the planes of the new embankment.

Unless otherwise provided on the Plans, no separate measurement or payment will be made for the construction and /or removal of cofferdams, cribs, sheet piles or other protective measures provided to safeguard an excavation, such being considered incidental to the work. When items for cofferdams or cribs for individual piers or bents are provided by the Plans, such will be measured in individual lump sum items for the pier or bent designated.

When a bid item for sheet piles is provided by the Plans, payment will be as specified. Where payment for the sheet piles is by the square foot (square meter), measurement will be based on the sheet pile length required by design to retain and counteract lateral earth forces, plus 1 foot. Where shoring is required by the regulations of the Occupational Safety & Health Administration (OSHA), the Contractor shall submit to the Engineer, prior to starting work, computations and drawings, prepared by and stamped by a Professional Engineer licensed in Tennessee, showing the basis for the design.

When the Plans indicate that direct payment will be made for excavation for box bridges, box culverts, retaining walls or minor structures, including pipe culverts and sewers, the volume of Culvert Excavation (Unclassified) will be determined by measuring the actual quantity excavated between the normal ground surface and the foundation elevation, as approved, provided the limits of the excavation do not extend beyond the vertical planes located 18 in. (45 cm), horizontally, outside the neat lines of the section of the structure at foundation elevation, as indicated

or directed. For box bridges and box culverts without bottom slabs the foundation elevation is considered to be the bottom of footings and the flow line elevation between footings. No allowance will be made for overlapping areas.

Where internal forming is required as for cut off walls, etc. the limits of excavation to be measured for payment will be 12 in. (30 cm), horizontally, outside the neat lines of the completed work and vertically from foundation elevation to the bottom of the completed excavation.

No increase or decrease in payment will be allowed for changes in amount of excavation due to the shifting of location of structures from that shown on the plans or for the addition of structures to those shown on the Plans when the Plans do not indicate that direct payment will be made for this excavation. Further, if this area of excavation, namely 18 in. (45 cm) horizontally outside of the neat line of the structure at foundation elevation, overlaps an area in which the excavation is computed on a separate unit price, the excavation in the overlapping area will not be allowed.

The volume of Culvert Excavation (Unclassified) for pipe culverts, when direct payment for this excavation is indicated on the Plans, will be determined by measuring the actual quantity excavated between the normal ground surface and the bottom of the excavation for the pipe, as approved, provided the limits of the excavation do not extend beyond 2 vertical planes separated by a horizontal distance equal to the outside diameter of the pipe plus 3 ft. (1 m).

Rock required to be removed and the space backfilled in order to prepare a satisfactory bed for pipe culverts will be computed only for a depth of 6in. (15 cm) below the bed of the pipe, as approved. No allowance will be made for the material used in backfilling, except bedding material when specified.

No allowance will be made for shaping necessary to accommodate the bells of the pipe.

The volume of Dry Excavation (Bridges), Wet Excavation (Bridges), Rock Excavation (Bridges) and Bridge Excavation (Unclassified) will be determined by measuring the actual quantity excavated between the normal ground surface and the bottom of the excavation as approved, provided the limits of the excavation do not extend beyond vertical planes located 18 in. (45 cm) horizontally outside of the neat lines of the section of the structure at foundation elevation, or where a concrete seal is used, do not extend beyond the neat lines of the concrete seal, as specified or directed.

The volume of excavation necessary to form struts, diaphragms, beams, etc. will be determined by measuring the actual volume excavated between the normal ground surface and a plane located 12 in. (30 cm) below the members, provided the limits of the excavation do not extend beyond vertical planes located 18 in. (45 cm), horizontally, beyond the limits of the members.

In computing extra depth excavation, the working limits established herein will be adhered to.

Rock Drilling performed in accordance with **Subsection 204.10(a)** will be measured by the linear foot (meter).

The volume of Class A bedding shall be based on the theoretical quantity, in C.Y./ft. (m³/m) of pipe, on the standard drawings.

The volume of Class B bedding shall be based on the theoretical quantity, in cubic yards per foot (cubic meters per meter) of pipe, as shown on the standard drawings.

Backfill Material (Flowable Fill) shall be based on a theoretical quantity in cubic yards (cubic meters), as shown on the standard drawings. Measurement shall be made along the centerline of the pipe for the width of trench shown on the Plans.

204.13-Basis of Payment. Structure Excavation and Foundation Preparation of the various classes will be paid for only on the volume computed as set out in **Subsection 204.12**, Method of Measurement.

Embankment construction, sloping, shaping, dressing, disposal of excess or unsuitable material, final cleaning up, etc. will not be paid for directly but the cost of performing the requirements therewith shall be absorbed in the pay items hereinafter provided.

Unless otherwise indicated on the Plans, no direct payment will be made for Foundation Preparation and Backfill; and the costs involved shall be included in the unit prices bid for other items of construction.

Material moved prior to securing the necessary measurement; material specified to be moved under Excavation and Undercutting **Section 203**; slides or cave-ins occurring outside of the working limits stipulated in **Subsections 204.08** and **204.10**; material excavated outside of said working limits; material excavated, even though within the said working limits, below foundation elevation, as indicated or directed, and made necessary on account of the construction methods of the Contractor, or failure on his part to provide sufficient, or proper protection; presplitting of rock; material excavated below foundation when shooting; bulged material caused by driving piles in a foundation; water and its removal; and in general, material moved which it would have been unnecessary to move in order to complete the structure in accordance with the Plans, these Specifications, or the directions of the Engineer, will not be paid for.

(a) Culvert Excavation (Unclassified).

When direct payment is provide by the plans, this item will be paid for at the contract unit price per cubic yard (cubic meter) for Culvert Excavation(Unclassified), which price shall be full compensation for all Structure Excavation and Foundation Preparation, classified as Culvert Excavation(Unclassified), performed within the limits stipulated in **Subsections 204.08** and **204.10** and which has been performed in accordance with the conditions, stipulations, provisions, and requirements contained therein.

(b) Dry Excavation (Bridges).

This item will be paid for at the contract unit price per cubic yard (cubic meter) for Dry Excavation (Bridges), which price shall be full compensation for all Structure Excavation and Foundation Preparation, classified as Dry Excavation(Bridges), which has been performed in accordance with the conditions, stipulations, provisions, and requirements contained herein.

(c) Wet Excavation (Bridges).

This item will be paid for at the contract unit price per cubic yard (cubic meter) for Wet Excavation (Bridges), which price shall be full compensation for all Structure Excavation and Foundation Preparation, classified as Wet Excavation(Bridges) which has been performed in accordance with the conditions, stipulations, provisions and requirements contained herein.

(d) Rock Excavation(Bridges).

This item will be paid for at the contract unit price per cubic yard (cubic meter) for Rock Excavation(Bridges), which price shall be full compensation for all Structure Excavation and Foundation Preparation, classified as Rock Excavation (Bridges), and which has been performed in accordance with the conditions, stipulations, provisions, and requirements contained herein.

(e) Bridge Excavation (Unclassified)

This item will be paid for at the contract unit price per cubic yard (cubic meter) for Bridge Excavation (Unclassified), which price shall be full compensation for all Structure Excavation which has been performed in accordance with the conditions, stipulations, provisions and requirements contained herein.

(f) Extra Depth Structure Excavation and Foundation Preparation.

Extra Depth Structure Excavation and Foundation Preparation, classified as Culvert Excavation (Unclassified), made necessary by the Engineer establishing the foundation below the elevation indicated on the Plans, will be paid for at the contract unit price per cubic yard(cubic meter) for Culvert Excavation (Unclassified), and this price shall be accepted by the Contractor as full compensation for performing this extra depth structure excavation and foundation preparation in accordance with the conditions, stipulations, provisions, and requirements set out in these Specifications for Structure Excavation and Foundation Preparation of this class.

Extra Depth Structure Excavation and Foundation Preparation for bridges made necessary by the Engineer requiring excavation below the foundation elevation indicated on the Plans, will be paid for on a basis of the contract price per cubic yard (cubic meter) for Dry Excavation(Bridges), Wet Excavation(Bridges), Rock Excavation(Bridges), as classified for the actual quantity in cubic yard (cubic meter), excavated from the designated zone, this zone being between the elevation shown on the Plans and the final approved elevation, as directed by the Engineer, plus the additional percentages for each zone corresponding to the depths lowered below Plan elevation as set out in the following schedule:

Sub-Item Designation	Zone No.	Depth Lowered Below Plan Elevation		Per cent
		More Than	Additional Not Over	
None	0 (0 m)	0 ft. (1.2 m)	4 ft.	0.0
a	1 (1.2 m)	4 ft. (2.4 m)	8 ft.	50.0
b	2	8 ft. (2.4 m)		80.0

In the above table, the depths to be used for computing the volumes of material for payment under any sub-item will be the depths applicable to each zone between the foundation elevation as indicated on the Plans and the final foundation elevation as approved by the Engineer, for example: If the foundation has been lowered 7-1/2 ft. (2.3 m) below the foundation elevation as indicated on the Plans, the volume for the sub-item shall be computed for a depth of 3-1/2 ft. (1 m) and multiplied by the contract unit price for the class of material excavated plus 50%. The volume of material down to a level 4 ft. (1.2 m) below the foundation elevation as indicated on the Plans shall be paid for at the contract unit price for the class of material excavated.

The contract unit price for the class of material excavated plus the additional percentage above provided shall be accepted by the Contractor as full compensation for performing Extra Depth Structure Excavation and Foundation Preparation, classified as Dry Excavation (Bridges), Wet Excavation (Bridges), or Rock Excavation (Bridges), in accordance with the conditions, stipulations, provisions, and requirements set out in these Specifications for Structure Excavation and Foundation Preparation of the respective classes.

(g) Rock Drilling (Bridges).

This item will be paid for at the contract unit price per linear foot (meter) for Rock Drilling (Bridges).

(h) Concrete for Class A Bedding.

Concrete for Class A Bedding will be paid for at the contract unit price per cubic yard (m³) for Bedding Material (Pipe) Class A, complete in place.

(i) Material for Class B Bedding.

Material for Class B Bedding will be paid for at the contract unit price per cubic yard (cubic meter) for Bedding Material (Pipe) Class B, complete in place.

(j) Cofferdams or Cribbs.

When items for cofferdams or cribs have been provided for and installed for a designated pier or bent, the lump sum item shall be full compensation for the furnishing and installation of all material, maintenance, removal, satisfactory clean up of the area and for all tools, equipment, labor and incidentals necessary to complete the work. Concrete seal shall also be included except when otherwise noted on the plans.

(k) Foundation Preparation

When the Plans indicate that direct payment will be made for foundation preparation, the lump sum item shall be full compensation for the preparation of foundations for all substructures. The cost for cofferdams, shoring, pumping or seal concrete required to establish the approved footing shall be incidental to the lump sum bid for Foundation Preparation, except payment will be made at 40% of the price bid for the footing concrete when approved by the Engineer:

- (1) For leveling placed within the neat lines of the bottom of the footing, where permitted, and
- (2) For additional seal concrete required by changes directed by the Engineer. Payment will be made only for the additional seal concrete placed within vertical planes located 18 in. (45 cm) horizontally outside of the neat lines of the bottom of the footing. No payment of seal concrete shall be made for any depth the seal is embedded in sound material below the elevation of the bottom of the pier footing as shown on the plans in order to permit placement of an adequate seal.

Excavation required for the foundation preparation shall be paid as defined by these specifications except no percent increase will be allowed for extra depth excavation.

(l) Backfill Material (Flowable Fill)

Accepted quantities of Backfill Material (Flowable Fill) shall be paid for at the contract unit price bid per cubic yard (cubic meter) which shall be full compensation for all materials, mixing, transporting, placing and finishing of the flowable fill as well as all labor, tools, equipment and other incidentals necessary for the satisfactory completion of the work.

SECTION 205-EMBANKMENTS

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SECTION 205-EMBANKMENTS

205.01-Description. This work shall consist of constructing roadway embankments, including preparation of the area upon which they are to be placed; the construction of dikes within or outside the rights-of-way; the placing and compacting of approved material within roadway areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits, and other depressions within the roadway area all in accordance with these Specifications and in reasonably close conformity with the lines, grades, and typical cross sections shown on the Plans or established by the Engineer. Only approved materials shall be used in the construction of embankments and backfills. These materials shall consist of Road and Drainage Excavation, Channel Excavation, and Borrow Excavation material described in **Section 203**, or excess material as described in **Section 204**.

EQUIPMENT

205.02-Equipment. All equipment necessary for the satisfactory performance of embankment construction shall be on the project and approved by the Engineer before the work will be permitted to begin. Compaction shall be accomplished by the use of any type of compacting equipment that will produce the required result.

CONSTRUCTION REQUIREMENTS

205.03-Preparation of Embankment Areas. Before embankment construction in any area is begun, Clearing and Grubbing, Removal of Structures and Obstructions and preliminary erosion control measures per the approved Storm Water Pollution Prevention Plan (SWPPP) shall have been performed in accordance with the provisions of **Section 201, 202** and **209** respectively, of these Specifications.

The original ground surface, or the surface of any embankment layer in place, shall not be in frozen condition, and shall be free from quantities of snow, ice, and mud when a subsequent layer is placed thereon.

All depressions or holes below the natural ground surface, whether caused by grubbing or otherwise, shall be filled with suitable material and compacted to ground surface before embankment construction is started.

Unless shown otherwise on the Plans or in the Special Provisions, where embankment of less than 3 ft. (1 m) below subgrade is to be made, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, unsuitable material removed and replaced with suitable material and the cleared surface shall be completely broken up by plowing, scarifying or stripping to a minimum depth of 6 in. (15 cm). This area shall then be re-compacted. Sod not required to be removed shall be thoroughly cultivated before construction of the embankment. Whenever a compacted road surface containing granular materials lies within 3 ft. (1 m) of the subgrade, such old road surface shall be scarified to

a depth of at least 6 in. (15 cm). This scarified material shall then be re-compacted.

Concrete pavement, parking strip, and base, all with or without bituminous overlay, concrete curb and gutter, sidewalk, driveways, etc. shall be removed and disposed of as follows:

- If the items are below subgrade elevation, but by not more than 2 ft. (60 cm), they shall be removed, disposed of, and the work paid for in accordance with the provisions of **Subsection 202.06**.
- If the items are more than 2 ft. (60 cm) below subgrade elevation, they shall be broken into sizes not to exceed 2 ft. (60 cm) in maximum dimension and remain in place, unless otherwise directed. The cost of this work shall be included in the unit price bid for other items of construction and shall not be paid for directly.
- If the items are above subgrade elevation, the removal and disposal of same shall be measured and paid as Road and Drainage Excavation (Unclassified) as provided for in **Section 203**.

When the embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when the embankment is to be built in phases, the slopes that are steeper than 4:1 as measured at right angles to the roadway shall be continuously benched over those areas as the work is brought up in layers. Measurement for payment for benching side-hill slopes for embankment construction shall be in accordance with the applicable requirements of **Section 203.09**. Benching shall be of sufficient width to permit the operation of placing and compacting equipment. Each successive cut shall begin at the intersection of the original ground and the vertical side of the previous cut. Material thus cut shall be re-compacted along with the new embankment material at the Contractor's expense.

Backfilling around a structure, or any unit thereof, shall have been completed and thoroughly compacted to ground surface before any embankment materials are placed thereon.

205.04-Formation of Embankments. Perishable materials, such as brush, hedge, roots, stumps, parts of trees, etc. shall not be incorporated or buried in the embankments. Rock, broken concrete, etc., shall not be placed in embankment area where piling is to be placed or driven.

Embankments shall be so constructed that adequate surface drainage will be provided at all times. Roadway embankment materials that consist predominantly of soil shall be placed in horizontal layers not to exceed 10 in. (25 cm) in depth before compaction, and each layer shall be compacted to a density not less than 95% of maximum density. Unless otherwise specified, the top 6 in. (15 cm) of the roadbed in both cut and fill sections shall be compacted to 100% of maximum density.

Maximum density and optimum moisture will be determined by the Engineer in accordance with the "Standard Method of Test for Moisture Density Relationship of Soils Using a 5.5 lbs. (2.5 kgs) Rammer and a 12-in. (30.5 cm) Drop"(AASHTO T-99). For material with less than 5%

retained on a No. 4 (4.75 mm) sieve, use method A with 4 in. (10 cm) mold. For material with more than 5% retained on a No. 4 (4.75 mm) sieve but less than 50% retained on a ¾ in. (19 mm) sieve, use Method D with corrections according to T-224.

The correction is to be used on soils containing less than 50% plus ¾ in. (19 mm) material.

The determination of the density of the soil in place will be in accordance with an approved AASHTO method. Each layer of embankment shall be compacted to required density, and shall be approved before material for the next succeeding layer is placed. Placing and compacting areas shall be kept separate.

Where embankment is to be constructed across low swampy ground that will not support the earth moving equipment, the lower part of the fill shall be constructed in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. The embankment shall be constructed full width unless otherwise noted on the Plans or approved by the Engineer. In the construction of such a lift the density requirement will be waived but the moisture content of the material used shall not exceed the optimum moisture range for 95% density for that material. Maximum thickness and minimum density requirements will apply to all succeeding layers of the embankment.

When a minimum of 95% of maximum density is required, the moisture content of the material being compacted shall meet both the following conditions: (1) The moisture content shall be within the range of values at which 95% of the maximum density can be obtained as indicated by the moisture-density relationship curve and (2) the moisture content shall not exceed the optimum moisture content to the extent that the material pumps under loads applied by the construction equipment. Even if the required density is achieved and the moisture content is in range, if pumping occurs, these sections will be removed. The contractor will receive no payment in fill sections; however, in cut sections, undercutting will be paid per cubic yard(cubic meter).

When 100% of maximum density is required, the moisture content of the material being compacted shall meet condition (2) above and shall not vary from the optimum moisture content by more than plus or minus 3 percentage points.

The Contractor shall aerate the material or distribute and incorporate water uniformly therein, as necessary, to control the moisture content within the applicable limits set out above.

When the excavated material consists predominantly of rock the following shall apply:

(a) **Definition of Material.**

If deemed necessary by the Engineer, the Contractor will be required to conduct test or tests with a 60,000 lbs (27,200 kgs) static tamping foot roller (costs to be included in other items) to determine whether the material is degradable or non-degradable. Material that readily breaks down under 3 passes of the 60,000 lbs

(27,200 kgs) static tamping foot roller will be considered as degradable.

(b) **Non-degradable Rock.**

When sound, non-degradable rock is encountered in the unclassified excavation, the Contractor may be required to provide a mechanical means for separating the sound rock from degradable rock and other soils. The Engineer may direct the use of sound non-degradable rock in such areas as the backfilling of benches, lower and/or outside portions of embankments, rock buttresses or others in addition to embankment construction. All costs for the preceding to be included in the unit price bid for Road and Drainage Excavation (Unclassified).

Embankments composed of sound non-degradable rock of such size that the material cannot be placed in layers with a 10 in. (25 cm) thickness may be placed in layers not exceeding 3 ft. (1 m) in thickness. Rock fragments shall not exceed 2 ft (60 cm) in maximum dimension except that occasional individual rocks and boulders not exceeding 4 ft. (1.2 m) in height may be placed in the exterior portions of the embankment next to the slope face if permitted by the Engineer. If allowed, they are to be placed to prevent nesting and the adjacent voids filled with fine fragments to form a dense and compact mass.

Rock material shall not be dumped into its final position but shall be placed by blading or dozing in a manner that will minimize voids, pockets and bridging. Each layer shall be leveled the full width of the embankment. Rolling will not be required in the construction of a rock embankment of sound non-degradable material with layers in excess of 10 in. (25 cm).

(c) **Degradable Rock.**

When degradable rock, as defined in (a), is encountered and is designated to be used in the embankment, compaction of the degradable rock shall be accomplished with an approved vibratory tamping-foot roller in conjunction with a static tamping-foot roller. The minimum weight for the static tamping-foot roller shall be 60,000 lbs (27,200 kgs). The minimum compaction effort, as rated by the manufacturer, for the vibratory tamping-foot roller shall be 55,000 lbs (25,000 kgs). Roller specifications shall be submitted to the project Engineer for approval prior to use.

Embankments constructed of degradable rock shall be placed in 10 in. (25 cm) maximum loose lifts and shall receive a minimum 3 coverages with the static roller and 2 coverage's with the vibratory roller. The Engineer may direct additional coverages with either or both rollers until satisfactory breakdown and compaction is accomplished. No additional compensation will be allowed for the compaction equipment and requirements specified herein, the costs of which shall be included in other items of

construction. Degradable rock shall not be placed in the top 5 ft. (1.5 m) of any embankment unless approved by the Engineer.

When embankment composed of degradable rock is found to be dry, the Contractor will be required to apply water to this material in order to facilitate its compaction. The amount of water will be that required to achieve approximate optimum moisture for the particular material involved. The added water shall be uniformly mixed with the material for the entire depth of the lift by blading, discing or other approved methods.

(d) **Combination of Degradable and Non-Degradable Rock.**

Blending or combining of degradable rock and non-degradable rock in a common lift will not be allowed unless approved in writing by the Engineer.

If approved, embankments constructed of a mixture of degradable rock and non-degradable rock or rock and soil, shall be placed in layers not exceeding 10 in. (25 cm) in thickness unless directed otherwise by the Engineer. If the combined material is predominantly sound, non-degradable rock with the thickness of the rock fragments in excess of 10 in. (25 cm), the layers may be increased as directed by the Engineer consistent with the size of the material, not to exceed 3 ft. (1 m). The mixture shall be placed by blading or dozing in a manner that will minimize voids, pockets, and bridging. The mixture shall be compacted with suitable compaction equipment as defined in (a) and when directed, shall be wetted to facilitate compaction. Water, if required, shall be uniformly mixed with the material for the entire depth of the lift by blading, diskings, or other approved methods.

(e) **Density Requirements.**

Density requirements will not apply to portions of embankments constructed of materials that cannot be tested by approved methods.

(f) **Payment**

Water required and furnished by the Contractor to facilitate compaction shall be paid for at the price bid per M.G. (1,000 gal.) (cubic meter) for "Water" which price shall include full payment for furnishing and applying the water, mixing, labor, and equipment. All other costs associated with the preceding is to be included in the unit price bid for Road and Drainage Excavation (Unclassified).

When the Plans require Solid Rock Fill, the material shall consist of sound, non-degradable rock (granite, gneiss, limestone or other approved material). When the material is subjected to five alternations of the sodium sulfate soundness test (**AASHTO T 104**), the weighted percentage of loss shall be not more than 12. Plastic soil or shale material will not be allowed. The Solid Rock Fill shall be placed where specified in the Plans or directed by the Engineer.

The roadway through rock fills shall be constructed to the grading line shown on the Plans with an allowable working tolerance of plus 1 to minus 3 in. (plus 25 to minus 75 mm). The portions of the roadway that are then below grade shall be brought to grade with spalls or other suitable granular material that is available from the excavation within the balance. If no such excavation is available, the Engineer may direct the Contractor to use approved base material for bringing the fill to grade, not to exceed the 3 in. (75 mm) limit as specified above. Payment for furnishing and placing said base material will be made at the unit price bid per ton (metric ton) for the applicable item in **Subsection 303.14**. When base material is not a bid item in the Contract, the material shall be furnished under the provisions of **Subsection 104.03**.

Compaction of each layer of embankment shall be accomplished by the use of any type of compacting equipment that will produce the required results.

Embankment to be placed on both sides of a concrete wall or box type structure shall be so constructed that the embankment is always approximately the same elevation on both sides of the structure.

Embankment to be placed at the location of abutments, bents, etc. shall be constructed to finished grade prior to commencing excavation on the respective section of the substructure, unless otherwise specified on the plans. Embankment to be constructed on one side only of abutments wing walls, piers, etc. shall not be constructed until the super-structure is in place. Construction operations shall be so conducted that wedge action and excessive pressure against the structure is avoided.

205.05-Stability of Embankments and Cut Slopes. The Contractor shall be responsible for the stability of all embankments and cut slopes until final acceptance and shall replace at his own expense any portions which, in the opinion of the Engineer, have become displaced or damaged due to his carelessness or negligence. If the work has been constructed and protected properly, and damage to the embankments or cut slopes occurs due to unusual natural causes such as cloudbursts, floods, slides or subsidence, the Contractor will be paid for the material used in making the necessary repairs at the contract unit price for the classification covering the material designated by the Engineer to be used for this purpose. The removal of slides will be measured and paid for in accordance with the provisions of **Section 203**.

205.06-Disposal of Excess or Unsuitable Material. Disposal of excess or unsuitable material shall be performed in accordance with the provisions of **Section 203**, Excavation and Undercutting; or **Section 204**, Structure Excavation, Foundation Preparation, and Backfill.

COMPENSATION

205.07-Method of Measurement. Embankment will not be measured. The construction of embankments is a responsibility to be assumed by the Contractor in connection with the pay items enumerated in **Sections 203** and **204**, covering materials with which the embankments are constructed.

205.08-Basis of Payment. Embankments will not be paid for directly. The contract unit prices for the materials with which embankments are constructed shall be full compensation for all embankment construction that has been performed in accordance with the Plans and Specifications.

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SECTION 206-FINAL DRESSING

206.01-Description. This work shall consist of dressing all slopes and areas including borrow pit areas and embankments to within reasonably close conformity to the lines, grades and cross section indicated on the Plans or as directed by the Engineer, and generally preparing the project for final inspection and acceptance. The costs thereof shall be included in prices bid for other items of construction.

EQUIPMENT

206.02-Equipment. All equipment necessary for the satisfactory performance of this construction shall be on the project and approved before work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

206.03-Method and Scope of Work. Final Dressing shall be performed by hand work and machines to produce a uniform satisfactory finish to all parts of the roadway and other components of the project. The roadbed, shoulders, ditches and slopes shall be shaped within reasonably close conformity to the specified lines, grades and cross sections. Spoil banks, waste areas, etc. shall be dressed in a satisfactory manner. Rock cuts shall be scaled of all loose fragments and left in a neat, safe and workmanlike condition.

The entire rights-of-way shall be cleaned of all weeds, briars and brushes unless otherwise specified on the Plans. All structures, both old and new, shall be cleared and cleaned of all brush, drifts, heavy vegetation, sediment, rubbish, obstructions and other objectionable material.

Final dressing shall be performed prior to sodding and seeding operations when these construction items are included in the Contract.

Tracked machines used in the dressing of slopes shall be run up and down slopes as opposed to longitudinally.

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SECTION 207-SUBGRADE CONSTRUCTION AND PREPARATION

207.01-Description. This work shall consist of the construction and preparation of part or all of the roadbed to receive the immediate construction of a base or pavement thereon.

EQUIPMENT

207.02-Equipment. All equipment necessary for the satisfactory performance of Subgrade Construction and Preparation shall be on the project and approved before work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

207.03-Preparing Subgrade. The subgrade shall be prepared in reasonably close conformity with the lines and grades as shown on the Plans or as staked by the Engineer.

Excavation and Undercutting shall be performed in accordance with the provisions of **Section 203**.

Where the roadbed is below grade, the Contractor shall haul, spread and compact suitable material in sufficient quantity to correct the deficiency. Spreading and compacting material shall be performed in accordance with the pertinent provisions of **Section 205**.

Where the roadbed has been seeded for erosion protection or has vegetative growth established, the Contractor shall clip the roadbed to remove the deleterious material prior to placing the base or sub-base material.

The Contractor shall haul, spread and compact suitable material in sufficient quantity to correct deficiencies obtained by the removal of the deleterious material. The work shall be in accordance with pertinent provisions of **Section 205**.

Where sub-bases are to be constructed on the subgrade, the limits of the subgrade preparation shall extend across the entire section upon which the subbase course is to be applied, including the shoulders.

Where forms are required in the construction of base or pavement, the subgrade as prepared shall be 12in. (30 cm) wider, on each side, than the neat width of the base or pavement.

207.04-Compacting Subgrade. On subgrades that require reworking, all vegetation within the limits of the subgrade preparation described above shall be removed and disposed of as directed by the Engineer prior to beginning reworking and re-compacting operations. The density of the finished subgrade shall be equal to not less than 100% of the maximum density. The determination of optimum moisture, maximum density and density of the soil in place shall be in accordance with the provisions of **Subsection 205.04**. When field tests show failure to meet the density requirement, the subgrade shall be loosened by disking, harrowing or other

approved methods to a depth of not less than 6 in. (15 cm), then reshaped and re-compacted in conformity with the applicable requirements of **Subsection 205.04**. The subgrade material shall be moistened or aerated as necessary during mixing and compacting to provide optimum moisture content in accordance with the provisions of **Subsection 205.04**.

All soft, yielding material which will not compact readily shall be reworked or removed and replaced, and the replacement material compacted in accordance with the pertinent provisions of **Section 205**.

207.05-Drainage and Protection. Grading of Subgrade shall be performed in such a manner as to provide ready drainage of water from the subgrade. Ditches and drains shall be maintained to provide proper drainage during the construction.

The Contractor shall take all precautions necessary to protect the subgrade from damage. Hauling over the finished subgrade shall be limited to that which is essential for construction purposes.

All ruts or rough places that develop in a completed subgrade shall be smoothed and the subgrade re-compacted.

207.06-Checking Subgrade. As determined by checking, the lines, cross sections and grades of the subgrade as completed shall be in reasonably close conformity with those shown on the Plans for the bottom of sub-base, base, or pavement, or with those established by the direction of the Engineer.

The subgrade shall be constructed to the grading line shown on the Plans, with an allowable working tolerance of ± 1 in. (25 mm).

The subgrade shall be rechecked as stipulated in the respective sections governing construction of the several types of base and pavement.

207.07-Disposal of Excess or Unsuitable Material. If grading has been performed under a previous Contract, removal and disposal of unsuitable material below subgrade elevation in both cut and fill sections will be measured and paid for as Road and Drainage Excavation (Unclassified).

If grading is included in the Contract, removal and disposal of unsuitable material below subgrade elevation in cut sections will be measured and paid for as "Undercutting". In the subgrade of embankment sections, no measurement for payment will be made for the removal and disposal of excess or unsuitable material. The disposal of excess or unsuitable material shall be performed in accordance with the provisions of **Subsection 203.07**.

COMPENSATION

207.08-Method of Measurement. Measurement for Subgrade Construction and Preparation will be made along the median center-line of the project for divided sections, and along the center-line of the pavement for 2-lane and other undivided sections, excluding bridges, by the station (100 ft. (1,000 m)).

The volume of excess or additional material moved, or of unsuitable material removed, to be measured for payment in accordance with the

provisions of **Subsections 207.07** and **207.09** will be measured by the cross section method, or if that method is unfeasible, by some other method approved by the Engineer and computed in accordance with the provisions of **Section 109**, Measurement and Payment.

Water required for compaction will be measured by the M.G. (1,000 gal.) (m^3) by means of calibrated tanks or distributors, or by means of accurate water meters.

207.09-Basis of Payment. Payment for Subgrade Construction and Preparation per 100 ft. (1,000 m) station shall be full compensation for shaping and compacting the roadbed, all ramps, service roads, approaches, roadside rest areas, etc., as shown on the plans. It shall also include the moving or furnishing of any additional material required, or the disposal of excess material, provided the material to be placed or removed does not exceed a depth of 3 in. (75 mm). Where a depth of 3 in. (75 mm) is exceeded, the total quantity of material removed or placed will be paid for at the appropriate price bid per cubic yard (cubic meter) for Borrow Excavation (Unclassified) or Road and Drainage Excavation (Unclassified).

Where the Contract includes the construction of the combined grading, drainage, and pavement structure, the construction and preparation of the subgrade will be considered as an obligation in connection with the construction and preparation of the road, and the material moved will be classified and included in the computation of pay items provided in Excavation and Undercutting, **Section 203**.

When the Contract provides for the construction of a sub-base, base, or pavement on a road that has been graded under a previous Contract, and the Item for Subgrade Construction and Preparation is included in the Contract, this Item will be paid for at the contract unit price per 100 ft. (1,000 m) station for Subgrade Construction and Preparation. Payment for material moved will be subject to the stipulations set out in the first paragraph of this **Subsection**.

Unless designated by the Plans, the clipping of a roadbed that has been seeded will not be paid directly but the costs shall be incidental to other items of construction.

Water applied as ordered by the Engineer will be paid for at the contract unit price per M.G. (1,000 gal. (m^3)), as provided in **Section 203**.

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SECTION 208-SHOULDERS AND DITCHES

208.01-Description. This work shall consist of the construction of shoulders and ditches adjacent to both sides of the base or pavement, to obtain proper drainage, in accordance with these Specifications and in reasonably close conformity with the lines, grades and typical cross sections shown on the Plans, or as directed by the Engineer.

MATERIALS

208.02-Materials. Material for constructing shoulders may be obtained by cleaning out side ditches, if approved by the Engineer. If additional material is required, it shall be furnished by the Contractor from approved sources.

EQUIPMENT

208.03-Equipment. All equipment necessary for the satisfactory performance of this work shall be on the project and approved before work will be permitted to begin. Compaction shall be accomplished by the use of any type roller that will produce the required results.

CONSTRUCTION REQUIREMENTS

208.04-General. During construction of shoulders every precaution shall be taken to protect the surface and edges of pavement. No shoulder work shall be started until the pavement has developed effective resistance to damage.

Shoulder construction shall be completed by blading, moistening as may be necessary, and thoroughly compacting. After completion the shoulders shall be maintained with respect to lines, grades and cross sections until final acceptance of the project.

208.05-Final Cleanup. Final Dressing shall be performed in accordance with the applicable provisions of **Section 206**.

Disposal of excess or unsuitable material shall be performed in accordance with the provisions of **Subsection 203.07**.

Final cleanup shall be performed in accordance with the provisions of **Subsection 104.11**.

COMPENSATION

208.06-Method of Measurement. Shoulder and ditch construction will be measured by the mile (km) along each respective shoulder and/or ditch constructed or reworked.

Material required in excess of that obtained by cleaning out side ditches will be measured by cross sectioning the approved borrow pit or pits before and after removal of the material.

Water will be measured by the M.G. (1,000 gal.) (m³) by means of calibrated tanks or distributors, or by means of accurate water meters.

208.07-Basis of Payment. Shoulder and ditch construction will be paid for at the contract unit price for Shoulders and Ditches per linear mile (km). Material required in excess of that obtained by the cleaning outside ditches will be paid for at the contract unit price per cubic yard (m^3) for Borrow Excavation (Unclassified). Water applied as ordered by the Engineer will be paid for at the contract unit price per M.G. (1,000 gal.) (m^3).

SECTION 209-PROJECT EROSION AND SILTATION CONTROL

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SECTION 209-PROJECT EROSION AND SILTATION CONTROL

209.01-Description. This work shall consist of temporary and permanent measures to control erosion and siltation through the use of fiber mats, netting, mulches, grasses, slope drains, sediment basins, temporary silt fences and other control devices.

The siltation control measures shall be performed so as to achieve economical, effective and continuous erosion and siltation control in all phases of construction per the approved Storm Water Pollution Prevention Plan (SWPPP).

209.02-Classification. Siltation and erosion control methods will be classified and paid for under the following designations or as otherwise specified.

- (a) Temporary Berms.
A temporary berm is constructed of compacted soil, with or without a shallow ditch to prevent excessive erosion until permanent controls are installed or slopes stabilized.
- (b) Temporary Slope Drains.
A temporary slope drain is a facility consisting of metal pipe, plastic pipe, flexible rubber pipe or other material acceptable to the Engineer that may be used to carry water down slopes to reduce erosion.
- (c) Sediment Structures.
Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.
- (d) Check Dams.
Check dams are barriers composed of logs and poles, large stones or other materials placed across a natural or constructed drain way.
- (e) Temporary Seeding and Mulching.
Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.
- (f) Brush Barriers.
Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operation.

Brush barriers are placed on natural ground at the bottom of fill slopes, where the most likely erodible areas are located to restrain sedimentation particles.

(g) Baled Hay or Straw Checks.

Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing 5 C.F. (0.15 m³) or more of material.

(h) Temporary Silt Fences and Filter Barriers

Silt fences and filter barriers are temporary measures utilizing filter cloth and other materials as designated on the Plans. The filter cloth shall meet the requirements of AASHTO M 288 for Sediment Control fabrics.

(i) Temporary Sediment Filter Bags.

The sediment bags may be utilized either on slope drains, pipe culverts, box bridges, or for pumping sediment from sediment traps and sediment basins. This construction shall be performed as shown on plans or as directed by the Engineer. The material shall be a non-woven geotextile fabric bag resistant to rot, mildew, puncture and tearing, with a minimum seam breaking strength of 200 lbs(90 kgs) The seams shall demonstrate less elongation and deformation than the geotextile fabric.

GEOTEXTILE FABRIC SPECIFICATIONS

	<u>Properties</u>	<u>Test Method</u>
Weight	8.0 oz/yd.	ASTM D 3776
Thickness	90-105 mils	ASTM D 1777
Grab Tensile	240 lbs.	ASTM D 4632
Grab Elongation at Break	50%	ASTM D 4632
Puncture Resistance	115 lbs.	ASTM D 4833
Trapezoidal Tear	100 lbs.	ASTM D 4533
Mullen Burst	350 lbs.	ASTM 3786
Water, Flow Rate	105 gpm/ft.2	ASTM D 4491
Permittivity	1.7 sec.-1	ASTM D 4491
UV Resistance	85% str. Ret.	ASTM D 4355

Standard Bag Minimum Dimensions

14.5 x 1.5 x 6.5 ft. and 14.5 x 2 x 13.25 ft.

Maximum Flow Rate

14.5 x 6.5 ft. up to 500 gpm

14.5 x 13.25 ft. up to 2,000 gpm

A manufacturer's label designating the maximum allowable flow rate of the bag in gallons per minute shall be permanently attached to each bag.

EQUIPMENT

209.03-Equipment. All equipment necessary for the satisfactory performance of this work shall be on the project and approved, before work will be permitted to begin.

CONSTRUCTION REQUIREMENTS

209.04-Project Review. Prior to the preconstruction conference the Contractor shall meet with the Engineer to discuss potential problems with erosion and siltation control due to construction activities and actions to be taken to prevent such problems. Pursuant to this discussion the Contractor shall prepare a comprehensive erosion and siltation control plan in accordance with **Subsection 209.05** below and the approved SWPPP. The plan shall be continuously implemented to effectively control erosion and siltation during the term of the contract.

209.05-Preconstruction Conference. At the preconstruction conference the Contractor shall submit for acceptance his plan for the staging of his operations and for accomplishment of temporary and permanent erosion and siltation control work for: (1) All areas within the rights-of-way as are applicable for clearing and grubbing, grading, bridges and other structures at water courses, paving and incidental construction and (2) Areas outside the rights-of-way that will be disturbed by the construction such as borrow areas, waste areas, haul roads and staging areas. The Contractor's plan for erosion and siltation control work shall incorporate and supplement, as applicable, the basic control devices shown in the plans to provide acceptable temporary and permanent siltation controls during all stages of construction. No work shall be started until the erosion control plan, including the staging of temporary and permanent erosion control measures, has been accepted by the Engineer. Rejection of all or part of the plan shall not constitute a basis for an extension of contract time.

The erosion and siltation control plan shall be updated as work progresses to show changes due to revisions in work schedules or sequence of construction, or when directed by the Engineer.

209.06-Construction Requirements. Prior to or simultaneously with the clearing and grubbing operations, the Contractor shall install siltation control devices in accordance with the approved erosion control plan. Such work may involve the construction of temporary berms, dikes, dams, silt fences, sediment basins, lined channels, permanent cut-off ditches, slope drains or other control devices as necessary to prevent and control erosion and siltation. Water from cofferdams is not to be pumped directly into streams, but is to be pumped into sediment ponds or traps. No grading shall be performed until the erosion and siltation control devices are in place to the satisfaction of the Engineer. Areas to be graded shall not be cleared and grubbed more than 20 calendar days prior to beginning grading operations in such areas. Stockpiled topsoil or fill material is to be treated so the sediment runoff will not contaminate surrounding areas or enter nearby

streams. In order to reduce sediment in runoff, erosion control structures shall be installed promptly during all construction phases.

The Contractor's operations shall be staged so that graded or otherwise disturbed erodible surfaces are protected as the work progresses. Once the Contractor begins grading for a roadway cut or embankment, he shall maintain a continuous, viable operation to complete the cut or embankment to subgrade elevation, unless otherwise approved in writing by the Engineer. Exposed erodible cut or embankment slopes shall be final dressed, topsoiled and protected with permanent seeding, sodding, matting or other acceptable erosion and siltation control measures in vertical increments not exceeding 25 ft. (7.5 m) as the work progresses; and no portion of these slopes shall remain unprotected for more than 20 calendar days unless the Engineer determines that weather conditions or other special circumstances preclude current placement of permanent control measures. Temporary erosion control measures shall be implemented as directed by the Engineer.

Seeding, sodding, matting or other acceptable erosion and siltation control operations shall be initiated within 48 hours after any one of the following conditions occurs:

1. Each 25 ft. (7.5 m) vertical increment is graded or
2. Upon suspension or completion of grading operations in a specific area.

The above requirements for progressive siltation control also apply to graded areas off the rights-of-way such as waste areas, borrow areas and haul roads.

The Contractor shall incorporate all permanent erosion and siltation control features into the project at the earliest practicable time. Temporary erosion and siltation control features shall be used to control erosive conditions that warrant protection prior to installation of permanent control features or that are needed to temporarily control erosion or siltation that develops during construction but which is not associated with permanent control features on the project.

Where construction activities cross or border areas of depression (ie. Sinkholes without openings or open throats), erosion control measures shall be installed and maintained as shown in the plans. When construction activities encounter an open throated sinkhole (Class V Injection Well), the Engineer shall be notified immediately and a minimum of a single row of silt fence backed by hay or straw bales and shall be installed as detailed on the Standard Drawings and **Subsection 209.07 (g) of the Standard Specifications** or other measures prescribed in the approved SWPPP shall be employed. The measures mentioned above shall encircle the sinkhole opening so as not to allow any silt to enter the opening.

In the event of conflict between these requirements and erosion and siltation control laws, rules or regulations of other Federal or State or local agencies, the more restrictive laws, rules or regulations shall apply.

209.07-Construction of Structures

(a) Temporary Berms.

A temporary berm shall be constructed of compacted soil, with a minimum width of 24 in. (60 cm) at the top and a minimum height of 12 in. (30 cm) with or without a shallow ditch, constructed at the top of fill slopes or transverse to center line on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately a 10 degree angle with a perpendicular to center line. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be constructed with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

(b) Temporary Slope Drains.

Temporary slope drains shall consist of metal pipe, plastic pipe, flexible rubber pipe, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.

All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drain shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet end shall be properly constructed to channel water into the temporary slope drain. Energy dissipaters, sediment basins or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream. An ideal dissipater would be rip rap or a small sediment basin which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

(c) Sediment Structures.

Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditchlines atop waste sites; in the ditchlines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. Sediment structures shall be constructed in accordance with sizes shown on the Plans or as approved by the Engineer.

When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all

excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

(d) Check Dams.

Check dams shall be utilized to retard stream flow and catch small sediment loads. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan. All check dams shall be keyed into the sides and bottom of the channel a minimum depth of 2 ft. (60 cm). A design is not needed for check dams but some typical designs are shown in the standard plans. Stone check dams should generally not be utilized where the drainage area exceeds 50 acres (20 hectares). Log and pole structures should generally not be used where the drainage area exceeds 5 acres (2 hectares).

(e) Temporary Seeding and Mulching.

Seeding and Mulching shall be performed in accordance with **Section 801**-Seeding. Mulching may be required on areas that have not been seeded, in which case the rate of application of asphalt binder is to be approximately 6 gal. per unit (1,000 sq. ft.) (25 liters per 100 m²).

Fertilizer and agricultural limestone shall be applied as specified in **Subsection 801.05** for permanent seeding.

(f) Brush Barriers.

Brush Barriers shall consist of brush, tree trimmings, shrubs, plants and other approved refuse from the clearing and grubbing operation. The brush barriers shall be constructed approximately parallel to original ground contour. The top of the brush barrier shall be at least 5 ft. (1.5 m) below the finished roadway. The brush barrier shall be compressed to an approximate height of 3 to 5 ft. (1 to 1.5 m) and approximate width of 5 to 10 ft. (1.5 to 3 m). The embankment shall not be supported by the construction of brush barriers.

(g) Baled Hay or Straw Erosion Checks.

Hay or Straw Erosion Checks shall be embedded in the ground a minimum of 4 in. (10 cm) to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose, as determined by the Engineer. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.

(h) Temporary Silt Fence and Filter Barriers.

Temporary Silt Fences and Filter Barriers shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is an issue. Silt fences and filter barriers shall

be placed with the filter cloth material on the upper grade side of the fence and anchored into the soil. (See standard drawings)

The Contractor shall be required to maintain the silt fence and filter barriers in a satisfactory condition for the duration of the project or until its removal is requested by the Engineer. The silt accumulation at the fence may be left in place and seeded, removed, etc. as directed by the Engineer. Unless otherwise directed by the Engineer, all silt fence or filter barrier shall be removed prior to completion of the project and shall become the property of the Contractor.

(i) Temporary Sediment Filter Bags.

The sediment bags shall be placed on a road pad and surrounded by silt fence as shown on the plans and per Standard Drawings for Erosion Control and Landscaping.

Pumping From Sediment Traps. Place sediment filtering bag on a level stabilized area over dense vegetation, straw, or as detailed in plans. The pump utilized shall have a rating in gallons(liters) per minute of not more than $\frac{3}{4}$ the maximum flow rate of the bag. Insert the discharge hose into the corner of the bag and double clamp. Do not allow hose to extend into bag any more than 6 in. (15 cm). Monitor and evaluate the entire pumping operation to assure the bag and connection are functioning properly. A regulator to control flow rate should be attached to pump or hose. At the beginning of the pumping operation the pumping rate should be reduced to approximately $\frac{1}{4}$ to $\frac{1}{2}$ its maximum rate for a period of 10 to 15 minutes, allowing the water to evenly spread over the bottom of bag before the maximum pumping rate begins. Bags may rupture when overfilled. Therefore the Contractor shall monitor regularly when filling and when the contained silt reduces the bags flow to approximately $\frac{1}{2}$ the rate of initial discharge, the bag must be replaced.

Placement upon Temporary Drains or Pipe Culverts. Place the bag a minimum of 6 in. (15 cm) upon the pipe and double clamp. Replace the bag when approximately $\frac{1}{2}$ full of sediment. Remove and dispose of the sediment in a manner satisfactory to the Engineer by removing the bag with sediment from environmentally sensitive areas or natural waterways. At a suitable disposal site, silt bag, remove sediment from the bag and smoothly grade into existing topography.

The Contractor shall install and maintain all temporary erosion and siltation control features until no longer needed or permanent control measures are installed. Any materials removed shall become the property of the Contractor. In order to insure erosion and siltation control structures work properly, it is imperative the sediment be removed; therefore, inspection and maintenance of structures is to be performed on a regular basis. During sediment removal, the Contractor shall take care to insure that structural components of erosion and siltation control structures are not damaged and thus made ineffective. If damage does occur, the

Contractor shall repair the structures at his own expense. Upon complete removal of sediment traps, special ditches, etc., the area where they were constructed is to be topsoiled, seeded and mulched.

In the event that temporary erosion and siltation control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense. (See special provisions 107F and 107P if applicable)

Where temporary erosion and siltation control work is acceptably performed and failure of all or any part of the system occurs but is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls and falls within the specifications for a work item that has a contract price, the units of work will be paid for at the proper contract prices except as noted below. Should the temporary erosion and siltation control work not be comparable to the project work under the applicable contract items, the Contractor shall be ordered to perform the work on a force account basis, or by agreed unit prices in compliance with **Subsection 109.04**.

Except as noted below, payment also may be made for replacement of temporary erosion and siltation control devices installed according to the plans or as approved by the Engineer provided such devices are no longer effective because of deterioration or functional incapacity, except that no payment shall be made for replacement of erosion and siltation control devices ineffective due to improper installation, lack of reasonable maintenance or because of failure of the Contractor to pursue timely installation of permanent erosion and siltation control devices in accordance with the Plans and Specifications or as directed by the Engineer.

Unless provided for on the plans, no direct payment will be made for temporary and permanent erosion and siltation control measures in disturbed areas outside the rights-of-way such as borrow areas, waste areas and haul roads unless the borrow areas or waste areas are provided for by the Department, and except for permanent Seeding (with Mulch) on borrow areas and waste areas within the limitations prescribed in **Subsection 203.04** and **Subsection 203.07**, respectively. Where the plans show separate quantities for erosion and siltation control items to be used outside the rights-of-way in connection with waste areas, borrow areas or other project related construction, payment will be made for these items used and accepted to the extent of these separately listed plans quantities; but the cost of any overruns in these items, or the cost of any additional items required for erosion and siltation control off the rights-of-way, shall be borne by the Contractor unless prior approval in writing is received from the Engineer.

In case of failure of the Contractor to control project related erosion or siltation, either on or off the rights-of-way, the Engineer may withhold payment of future progress estimates until the Contractor has satisfactorily performed the necessary corrective measures. If deemed necessary, the Engineer may employ outside assistance or use his own forces to provide the needed protective measures, with all incurred direct costs plus project engineering costs being charged to the Contractor by appropriate deductions from the Contractor's monthly progress estimate.

COMPENSATION

209.08-Method of Measurement. Temporary berms utilized on a daily basis will be considered as a necessary part of the unit price for road and drainage excavation and shall not be measured separately for payment.

The quantity of slope drains to be paid for shall be determined by the linear foot (meter) constructed and measured.

Excavation for the construction of sediment structures will be measured in accordance with the appropriate provisions of **Subsection 203.09**.

Sediment removal and disposal for cleaning of the sediment structures will be measured by the cubic yard (cubic meter).

Rock used for inlet and outlet control on sediment structures will be measured by the C.Y. (m³) in place in accordance with the appropriate provisions of **Subsection 109.01**.

Pipe used in the construction of sediment structures will be measured in accordance with the appropriate provisions of **Subsection 607.12**.

Concrete used in the construction of spillways or other structures pertaining to sediment structures will be measured in accordance with the appropriate provisions of **Section 703**.

Baled hay or straw erosion checks will be measured by the bale.

Check dams will be measured longitudinally across the top of the dam and on a vertical plane down to the contour of the bottom of the ditch and the number of S.F.(m²) calculated.

Brush barriers will be measured by the linear foot (meter) constructed and accepted.

Temporary silt fences and filter barriers will be measured by the linear foot(meter) constructed and accepted.

Temporary seeding and mulching operations will be measured in accordance with the appropriate provisions of **Subsection 801.09**.

Temporary Sediment Bags shall be measured per each for the size bag used per **Subsection 209.02 (i)**.

209.09-Basis of Payment. Accepted quantities of Temporary Slope Drains, and Brush Barriers will be paid for at the contract unit price per linear foot (meter).

Check Dams will be paid for at the contract unit price per S.F.(m²).

Sediment Removal, will be paid for at the unit price per C.Y. (m³).

Baled Hay or Straw Erosion Checks will be paid for at the contract unit price per bale.

Temporary Silt Fence and filter barriers will be paid for at the contract unit price per linear foot (meter) which price shall be full compensation for construction, maintenance, and removal.

The accepted quantities of Road and Drainage Excavation will be paid for at the contract unit price per C.Y. (m³).

Concrete used in the construction of spillways or other structures pertaining to sediment structures will be paid for in accordance with the appropriate provisions of **Section 703**.

Seeding (with Mulch), Seeding (without Mulch), Temporary Seeding (with Mulch) and Mulch items will be paid for in accordance with the appropriate provisions of **Subsection 801.10**.

Water used in preparation of the seed bed and for maintenance will be paid for at the contract unit price per M.G. (1,000 gal.) (m^3) of water.

The Temporary Sediment Bags will be paid for at the contract price bid per each for the size bag used which includes installation and/or replacement along with all materials, equipment, tools, labor, and incidentals to complete the work. Payment for removal and disposal of material from bag shall be made by the C.Y. (m^3) at contract price for sediment removal.